MYSORE LEGISLATIVE ASSEMBLY

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COMMITTEE ON ESTIMATES

THIRD REPORT

(Fourth Assembly)

MYSORE IRON AND STEEL LIMITED

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October 1969

Legislature Secretariat, Bangalore

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COMMITTEE ON ESTIMATES

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MYSORE IRON AND STEEL LIMITED

October 1969

Mysore Legislature Secretariat, Bangalore

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* Chairman of the Committee

M. Y. GHORPADE
Chairman,
Estimates Committee

SANDUR
Bellary District.
Camp : Bangalore
Dated, 29th October, 1969.

To

The Speaker,
Mysore Legislative Assembly,
Bangalore.

Sir,

I have pleasure in forwarding to you the unanimous report of the Estimates Committee on the Mysore Iron and Steel Limited for publication and presentation to the Assembly at its next session. The report was finalised at the meeting of the Estimates Committee held on 25th, 26th and 27th October 1969. I shall be grateful if this report is also translated into Kannada.

With regards,

Yours sincerely,

M. Y. GHORPADE.

CONTENTS

CHAPTER I—Introductory—Purpose and Scope of Study

Para		Page
1	Early history	1
2	Production in 1923	1
3	1949 to 1968	2
4	Study of MISL (Mysore Iron & Steel Ltd.) by Estimates Committee.	2
5	Need to study other steel plants	3
6	Comparative study	4
7	Jamshedpur & Bhadravati	5
8	The Sandur-Hospet region	5
9	Inter-State mobility	6
10	HSL & HEC at Ranchi	6
11	Discussions at Delhi	7
12	Second visit to Bhadravati	8
13	References	8
14	Acknowledgements	8
15	MISL—bright future as an alloy steel plant	9

CHAPTER II—Historical Background and Development

1	Mysore distillation and Iron Works	10
2	First phase	11
3	Second phase	14
4	Third phase	16
5	Conversion to alloy steel plant	18
6	Demag proposal (1962)	18
7	MISL's Rs. 10 crores programme 1962	19
8	Industrial licence and production	20
9	Investment, production and sale value	21

CHAPTER III—Production and Demand for Steel

1	MISL and the steel industry	22
2	Pre-war period	22
3	Post-war	25
4	Plan targets and production	28

Para		Page
5	HSL (Hindustan Steel Ltd.)	29
6	Need for relationship between MISL and HSL	31
7	Demand projections	31
8	Need for new steel plant	34
9	Electric arc furnace and continuous casting	36
10	Pig iron	37
11	Ferro-alloys	38
12	Specialization in production and use of steel	39
13	Exports	42
14	Charts & diagrams	43

CHAPTER IV—Alloy and Special Steels, Ferro-Alloys and Pig Iron.

1	Alloy and special steels—definition	44
2	Application and uses	45
3	Demand estimates—NCAER	46
4	Demand estimates—Steering Group	48
5	Production and finishing capacities	50
6	Investment needs	52
7	Licensed capacities	53
8	Stainless steel	54
9	Ferro-alloys	55
10	Pig iron	56
11	Steel forgings	60
12	Steel castings	61

CHAPTER V—Steel Prices & Costs

1	Broad objective	62
2	Investment and sales	62
3	Prices and cost of production	63
4	Capital block and price increase	64
5	HSL losses and price increase	66
6	Retention prices	70
7	Informal price control—JPC	72
8	Alloy steels	73

Para		Page
	CHAPTER VI—Production and Productivity	
1	Electric pig iron	74
2	Production and sales of pig iron	74
3	Quality and price of pig iron	75
4	Mild steel	78
5	Alloy and special steels	79
6	Electric arc furnace	81
7	Duplexing	82
8	Rolling & Finishing facilities	83
9	L.D. converters	84
10	Utilisation of pig iron	86
11	Some implications	87
12	Performance and production flow sheet	89
	CHAPTER VII—Financial Aspects	
1	Profit and loss	95
2	Comparison of profit and loss	96
3	Productwise profitability 1967–68	97
4	Economics of electric arc furnace	99
5	Balance sheet for the year 1967-68	100
6	Debt-equity ratio	102
7	Capital cost of conversion programme	103
	CHAPTER VIII—Raw Materials	
1	Costs	106
2	Iron ore and sinter	107
3	Coke	111
4	Electricity	112
5	Limestone, quartz and manganese	114
6	Scrap	115
7	Water	116
	CHAPTER IX—Manpower And Management	
1	Salaries and wages	117
2	Incentive schemes	119
3	Productivity	121

Para		Page
4	Management	124
5	Planning and production control	125
6	Board of Directors	126
7	Technical collaboration	128
8	Organisation	131

CHAPTER X—Summary and Conclusions

1	Introductory—purpose and scope of study	133
2	Historical background and development	134
3	Production and demand for steel	136
4	Alloy and special steels, ferro-alloys and pig iron	140
5	Steel prices and costs	142
6	Production and productivity	143
7	Financial aspects	146
8	Raw materials	149
9	Manpower and management	150

APPENDICES

		Page
I.	Details of the study tour programme of the Estimates Committee.	154
II.	Data and points for discussion and study by the Estimates Committee.	156
III.	Case for Steel Plant in Sandur-Hospet Region	161
IV.	Basis of estimates of steel demand by National Council of Applied Economic Research (NCAER).	167
V.	Bibliography	169

TABLES

No.		Page
1.	List of production units at Mysore Iron & Steel Ltd. (MISL)—year of installation, capacity and book value as on 31st March 1968.	172
2.	Cost of conversion programme—MISL's estimate, actual expenditure and balance requirement.	173
3.	Production, imports, exports and consumption of saleable steel.	174
4.	Comparative figures of production and apparent consumption of steel expressed in terms of crude steel in 1960 and 1964 in selected countries.	175
5.	Indian Standards Institute specifications for alloy and special steels.	177
6.	A projection of total costs and sales income of HSL plants at different levels of utilisation of capacity.	178
7.	Production of pig iron, steel ingots and saleable steel in 1967-68 for all the steel plants.	180
8.	Chemical analysis and JPC selling prices of pig iron.	182
9.	Capacity and actual production of different units at MISL for the years 1966-67, 1967-68 and 1968-69.	183
10.	Chemical analysis of special and alloy steels in the production line of MISL.	185
11.	Scrap generated within the plant	187
12.	Comparative details of operating units and capacities in different steel plants.	188

No.		Page
13.	Production and performance of the MISL operating units for 1967-68 and 1968-69.	194
14.	Norms and actual operational efficiencies of production units at MISL.	197
15.	Anticipated production flow sheet as envisaged by MISL for 1,09,000 tonnes of pig iron for sale, 87,000 tonnes of alloy & special steels and 39,000 tonnes of mild steel products.	200
16.	Summarised profit & loss account of MISL.	204
17.	Comparative profit & loss account of Indian steel producers for 1967-68.	206
18.	MISL's unitwise analysis of profit & loss for the year 1967-68.	208
19.	Economics of electric arc furnace for production of alloy and special steels using (a) LD metal and (b) scrap.	210
20.	Break-up of Balance Sheet of Mysore Iron & Steel Ltd. as on 31st March 1968.	211
21.	Cash flow statement for 1967-68—MISL.	212
22.	Consumption of raw materials in kg. per tonne of pig iron in all the steel plants for the year 1965-66.	213
23.	MISL's consumption of iron ore, sinter and coke	214
24.	Quantity and cost of raw materials per tonne of pig iron—MISL for 1966-67 and 1967-68.	215

No.		Page
25.	Cost of electric power and average cost per unit.	217
26.	Department-wise break-up of number of persons on the pay roll of MISL.	218
27.	Total number of persons employed, sales income and wages.	219
28.	Employment in works in all steel plants for 1965-66.	220
29.	Wage structure at MISL.	221
30.	MISL's works cost, direct labour cost and overhead charges for 1967-68.	222
31.	Number of and payments to foreign technicians at MISL.	223
32.	Payments made to Messrs. Bohlers, Vienna.	225
33.	Comparative statement of budget estimates and actuals as per MISL published accounts.	226

CHARTS

LIST OF

1. All India production of pig iron—1967-68.

2. All India production of saleable steel—1967-68.

3. MISL—Production and despatches of pig iron.

4. All India imports, exports and consumption of saleable steel.

5. MISL—sales by products—1967-68.

6. MISL—sales income—productwise—1967-68.

7. MISL—Number employed and payments and provisions.

8. MISL—Income & Expenditure—1967-68.

CHAPTER—I

Introductory—Purpose and Scope of Study

Early history.

1.1. On the wooded banks of the river Bhadra, the seeds of Mysore's industrialisation were sown in the early decades of this century by that great Ruler of Mysore, Krishnarajendra Wodeyar and his progressive Engineer—Dewan Dr. M. Visvesvaraya. The idea was born of their progressive imagination, patriotism and pioneering zeal. This industry naturally symbolised the industrial aspirations of modern Mysore, not only to those who started it but to all successive generations. It was intended to utilise the rich forest resources in the vicinity of Bhadravati, and the equally rich iron ore resources of Kemmangundi, in the Bababudan range of hills, 36 miles from Bhadravati. The effort to use technology to fully utilise the available natural resources truly reflected the spirit of modern self-reliance or 'Swadeshi'. The small sized, charcoal based, blast furnace is an interesting and unique feature of the beginnings of the Mysore Iron and Steel Works. Equally interesting is the fact that this industry was started as a wholly State owned enterprise, showing a clear recognition, even in those early years, that some capital intensive, basic industries need to be started in the public sector in order to initiate and expedite certain essential developments. In this sense, the industrial development at Bhadravati has a significant place in the early history of the public sector in our country.

Production in 1923.

1.2. This industrial enterprise which consisted of a wood distillation plant and a charcoal blast furnace of 60 tons capacity per day, started production in 1923. Its economics depended on the market for charcoal pig iron which was of a high quality and even found an export market in the United States. For the local utilisation of pig iron a vertically cast pipe plant was established with a capacity of 10,000 tons in 1927. The details of the expansion of Mysore Iron and Steel Works, Bhadravati, over the years, are given in the next chapter. However, during the early years, the

industry did not earn a surplus sufficient to provide for depreciation and a fair return on capital. The Mysore Iron and Steel Works was converted into a limited company (MISL) in April, 1962. However, for the sake of convenience, the Mysore Iron and Steel Works (MISW) has been referred to as MISL throughout this report.

1949 to 1968.

1.3. It is only from the year 1949 that differential retention prices were given to this industry by the successive Tariff Boards or Commissions based on its cost of production, depreciation and a return on capital. The system of differential retention prices was abolished in the year 1962 and the Joint Plant Committee (JPC) came into existence in the year 1964, in order to informally regulate prices of the major steel producers in the country. The MISL was not considered a major producer and was, therefore, free to sell its products at the available market prices, irrespective of the prices fixed by the Joint Plant Committee. During the period 1962-1965 there was general scarcity of steel in the country and the MISL was able to take advantage of the prevailing market conditions. After that, the industry has not been able to function profitably as costs increased and the prevailing prices were not adequate to cover these costs and leave a margin of profit to fully meet depreciation and interest. In the year 1967-68 the Profit and Loss Account showed a loss of Rs. 2.11 crores which would have been more if interest charges to the tune of Rs. 1.20 crores had not been capitalised during the year. For the year 1968-69 the loss is Rs. 3.06 crores and Rs. 4.35 crores after and before capitalising expenditure of Rs. 1.29 crores respectively.

Study of MISL by Estimates Committee.

1.4. This naturally caused considerable concern in the State and strong feelings were expressed in the Mysore Legislative Assembly by the members who were anxious that the whole situation was thoroughly examined and suitable measures were taken to prevent further deterioration and to ensure that the industry was put on a sound and stable basis as soon as possible. In response to this feeling of anxiety and concern in the State and in the Mysore Assembly, with regard to the future of Mysore Iron and Steel Ltd., Bhadravati, the

Estimates Committee of the Mysore Legislative Assembly decided, to make a detailed study of the working of the MISL. At the end of 1967-68 the total investment of MISL was of the order of Rs. 40 crores, which had been financed by loans to the extent of Rs. 24 crores and the balance of Rs. 16 crores represented the Government share capital including Rs. 14 crores of the Mysore Government and Rs. 2 crores of the Government of India. As against this capital investment of Rs. 40 crores, the total sale value of products for the year 1967-68 was only Rs. 12 crores and the loss was Rs. 3.3 crores including interest charges capitalised during the year. It is obvious that the financial stake of the Mysore Government in this industry is substantial and a loss of this order cannot be looked upon with equanimity. In view of the historical and economic significance of this industry at Bhadravati, it is necessary to dispassionately analyse the past and the present of the MISL with a view to ensure its future.

Need to study other steel plants.

1.5. Accordingly, the Estimates Committee visited Bhadravati on 18th, 19th and 20th April 1969 and held detailed discussions with Shri H. G. V. Reddy, Managing Director and Vice-Chairman and other Officers of the Company, after visiting the works in order to study the various aspects of the Company's operations. As an initial step the visit was extremely useful, but it became obvious that for a study in depth of MISL it was necessary to visit other steel plants in the country both in the public and private sectors. Bhadravati was no longer an isolated enterprise in the State of Mysore but a part of the steel complex in the country, subject to the interplay of various economic factors not confined to Bhadravati. The Committee fully recognised the significance of this inter-relationship between various economic factors and forces in the country affecting the steel industry, of which MISL was a part. No realistic planning was possible for MISL without taking into account the steel industry in the country as a whole. It was necessary to determine what exactly could and should be the special role of MISL in this national adventure of building up a steel industry, including alloy steels, to meet the growing needs and the increasingly sophisticated

requirements of the country. Product-mix and pricing policies become meaningful only in this context. The technical capacities and performance of different productive units could be realistically evaluated and understood only after studying the performance of iron and steel units of different sizes, operating under the existing conditions in our country, at the different steel plants. A comparative study of this nature would undoubtedly enable the Committee to realistically assess factors such as productivity trends, cost of raw materials, wages, incentives, maintenance, management and efficiency in general. The implications of the economics of scale had also to be studied in order to see in what manner the MISL could be made to function profitably and competitively inspite of its scale of operations being small compared to the large steel plants and the public sector units which had come into existence after independence. The Alloy Steel Plant at Durgapur was of special interest to the Committee as that was a modern alloy steel plant with a licensed capacity of 60,000 tons of alloy steel, while MISL was in the process of converting itself from mild steel production to alloy steel production with a licensed capacity of 77,000 tons. The Committee's inability to study MISL in isolation for the reasons stated above prompted it to take a decision to visit other steel plants in the country both in the public and private sectors at Bhilai, Rourkela, Burnpur, Durgapur and Jamshedpur. It was also decided to have discussions with the Planning Commission, State Ministry and other experts at Delhi and at Ranchi, the headquarters of Hindustan Steel Limited. The details of the tour programme of the Committee are given in Appendix-I. The Committee thanks the Speaker and the Chief Minister of Mysore for their co-operation in this regard.

Comparative study.

1.6. A questionnaire was drawn up and sent in advance to all the steel plants to indicate the data required and the points for discussion and study by the Estimates Committee. This data sheet and points for discussion is reproduced in Appendix-II. The idea of this communication to the various steel plants was to facilitate purposeful discussion during the Committee's visit and to collect data on a comparable basis.

The Committee records its appreciation of the co-operation received at all the steel plants and thanks the authorities concerned for their courtesy and hospitality. The Committee benefited greatly by its visits to these steel plants and especially by the discussions with the General Managers and all other senior executives and technical experts at these plants. It was heartening to meet so many keen and competent young technicians at all the public sector steel plants started in the post-independence era. The Committee was also impressed by the experience and outlook of the General Managers and the top executives of these plants which have a great future. At Jamshedpur the Committee stayed for five days and visited the ferro manganese plant at Joda, the National Metallurgical Laboratory, the Uranium Mines at Jadugoda and the Tata Engineering and Locomotive Company in addition to the Tata Iron and Steel Works, thanks to the excellent arrangements made by the Tata Organisation. The Committee had useful discussions with Shri S. K. Nanavati and Shri R. H. Mody, Directors of Tata Iron and Steel Company and other senior executives of the organisation, and wishes to thank them for all their hospitality.

Jamshedpur and Bhadravati.

1.7. Jamshedpur represents the beginning of the steel industry in India and the great dream of Sir Jamshedji Tata whose pioneering spirit conceived a steel plant as early as 1899. A few years later, the same pioneering spirit prompted Dr. M. Visvesvaraya to instal a charcoal pig iron furnace at Bhadravati. As a matter of fact Dr. M. Visvesvaraya, in a foreword to a brochure on MISL, has acknowledged the technical assistance received from the Tata Iron and Steel Works in preparing a scheme for the manufacture of charcoal pig iron at Bhadravati as a preliminary step. While Jamshedpur could develop into a major steel producing unit due to its proximity to the coal fields in the North-Eastern region of the country, the development of MISL at Bhadravati has been conditioned by the availability of charcoal in the initial stages and later by the availability of hydro-electric power.

The Sandur Hospet region.

1.8. MISL was the first to instal electric pig iron furnaces, and even to this day these are the only electric pig iron furnaces in the country, apart from the

15,000 kva Electric Reduction Furnace installed recently by the Sandur Manganese and Iron Ores Limited, near the Tungabhadra reservoir, at the foot of the Sandur range of hills. The Sandur-Hospet region is endowed with one of the richest and biggest iron ore deposits in the country. A broad-gauge railway line runs through this belt which is well connected with the ports on both the eastern and western coastal lines of the Indian peninsula. It is therefore ideally situated for the location of the next public sector steel plant. In this sense, the land of the Bhadra and the Tungabhadra in Mysore State have a common destiny and a great future in steel. The steel prospects and potentialities of the Sandur-Hospet region do not strictly come within the scope of this study. However, for completing the picture of the potentialities of the State as a whole in this context, a paper written by Shri M. Y. Ghorpade in the year 1967 entitled "A case for Steel Plant—Sandur-Hospet Region" is reproduced in Appendix-III.

Inter-state mobility.

1.9. During the Committee's visits to the public sector steel plants, it was very heartening to meet a number of technicians from our State who are occupying various positions of administrative and technical responsibility in these steel plants. At Bhilai and Rourkela the members of the Kannada Sangha met our Committee. It was a matter of satisfaction that so many young and qualified Mysoreans were working in the steel industry and had gained valuable experience. They are working far away from their home State and it is important that we in this State should know of the good work that they are doing, and do our best to encourage them. It was clear to the Committee that when a new integrated steel plant is started in our State, there would be no dearth of technically qualified people and specialised know-how to man and run the industry. It is good that there is so much inter-state mobility of technical personnel, and this trend should be encouraged in the interest of rapid industrial development in the country.

H.S.L. and H.E.C. at Ranchi.

1.10. After completing the study tour of the steel plants, the Committee visited Ranchi for a discussion with Shri K. T. Chandy, Chairman, Hindustan Steel

Limited and other officers of the Company. At Ranchi the Committee also visited the Heavy Engineering Corporation and the Central Engineering and Designs Bureau of Hindustan Steel in order to get an idea of the design and manufacturing capability being developed there. At Calcutta, on the way to Delhi, the Committee called on the Speaker of the West Bengal Legislative Assembly, when the Committee had the opportunity of meeting the Chief Minister Shri Ajoy Mukherjee, Deputy Chief Minister Shri Jyoti Basu and the Members of the Estimates Committee of the West Bengal Legislative Assembly.

Discussions at Delhi.

1.11. At Delhi the Committee called on the President Shri V. V. Giri, the Prime Minister Smt. Indira Gandhi and the Deputy Prime Minister Shri Morarji Desai and had the benefit of discussing some broad aspects of the problem connected with the growth of steel industry in general and the MISL in particular. The Committee had useful discussions with Dr. D. R. Gadgil, Vice-Chairman of Planning Commission; Shri C. M. Poonacha, Union Minister for Steel and Heavy Engineering; Dr. V. K. R. V. Rao, Union Minister; Shri B. R. Bhagat, Union Minister for Foreign Trade; Shri K. C. Pant, Minister of State for Steel and Heavy Engineering; Shri M. S. Gurupadaswamy, Minister of State; Shri M. B. Rao, Adviser, Planning Commission; Shri S. Boothalingam, Director General of National Council of Applied Economic Research, and Shri P. L. Tandon, Chairman, State Trading Corporation of India. To the Planners and Governmental authorities at Delhi, the Committee conveyed its impressions of the visits to the steel plants and the type of development envisaged at Bhadravati with the assistance of both the State and Central Governments. The Committee is grateful to all those persons and institutions, the benefit of whose valuable views and experience the Committee had during its study tour. This has enabled the Committee to look at the problems facing MISL in the proper perspective and against the background of the Indian steel industry as a whole.

Second visit to Bhadravati.

1.12. Shri M. Y. Ghorpade, the Chairman of the Estimates Committee, once again visited Bhadravati on 28th, 29th and 30th July 1969 and had discussions with Shri H. G. V. Reddy and other officers, on the basis of the information the Committee had gathered during its study tour, and with a view to check up some of its conclusions. The Committee is thankful to Shri H. G. V. Reddy and other officers of the Company for all their enthusiastic help and co-operation. The Committee and the authorities of the MISL were able to work in a co-operative spirit in order to analyse the problems of MISL and find solutions which would put it on a sound and stable footing. Much has been done at MISL, Bhadravati, since its inception in 1923. While recognizing this, it is the object of this study to determine what more needs to be done to make MISL an economically viable unit in the shortest possible time, and to learn from past experience.

References.

1.13. The Estimates Committee also tried to collect as much reference material as possible, within the time at its disposal, for the purpose of its study. A short bibliography is given in Appendix-IV. Some of this material was suggested by knowledgeable persons to whom the Chairman had addressed letters in the initial stages of the study. Shri L. K. Jha, Governor, Reserve Bank of India, Shri R. Venkatraman, Member, Planning Commission, Shri B. N. Adarkar, Deputy Governor, Reserve Bank of India, and Shri P. L. Tandon, Chairman, State Trading Corporation of India, were among those who replied to the Chairman's letter in this regard. The Committee is thankful to all those who took the trouble to make useful suggestions.

Acknowledgements

1.14. Dr. A. K. N. Reddy, Department of Chemistry, Indian Institute of Science, and Shri S. Venkatramiah, Structural Engineer and Chief Executive of Sandur Manganese and Iron Ores Limited, were informally associated with the work of the Committee as technical consultants. The Committee is of the view that the association of technically qualified people in the concerned field of interest or study is extremely helpful and should become a recognised practice. Exchange of views and experience between

technical persons and those in responsible positions, in the process of preparation of reports, is mutually beneficial and enhances the quality and value of reports of important public committees. In accounts and financial matters, the Committee was greatly helped by the valuable services of Shri P. K. Devanathan, Special Officer in the Finance Department. The Committee also received useful secretarial assistance from Shri C. S. Sreedhara Murthy, Under Secretary, Legislature Secretariat, and other members of the Legislature Secretariat. The Estimates Committee thanks all those who were closely associated with this work and contributed to it in a dedicated manner.

MISL-bright future as an alloy steel plant.

1.15. The main concern of the Estimates Committee was to understand and appreciate the technical and financial problems involved, and try to find realistic solutions which would be of direct relevance and interest to the Mysore Iron and Steel Limited, Bhadravati. MISL has a bright future as an alloy steel plant provided swift and effective steps are taken to complete its conversion from mild steels to alloy and special steels, and the management and working is made more dynamic and efficient.

CHAPTER II

Historical Background and Development

Mysore distillation & iron works

2.1. The Mysore Geological Survey Department set up in 1896 had proved the existence of sizable deposits of rich iron ore in the Bababudan range of hills. The establishment of an industry at Bhadravati was conceived in order to exploit these iron ore deposits and the forest wealth of the surrounding malnad areas. This industry was started originally as a wood distillation plant and a small blast furnace was also set up as an adjunct for utilising the charcoal which was one of the bye-products. The wood distillation plant had a carbonising capacity of 200 tons of wood per day, and the capacity of the blast furnace was only 50 to 60 tons of pig iron ore per day—a Lilliput compared to the large blast furnaces in India which have a capacity of 1,000 to 2,000 tons per day. In Japan they have blast furnaces with capacity of about 5,000 to 7,000 tons per day. However, charcoal pig iron is one of the finest in quality being very low in phosphorus and other impurities, and normally gets a premium in price over pig iron produced from coke-based blast furnaces. The economics of the "Mysore Distillation and Iron Works" depended on the profitable sale of various bye-products from wood distillation. However, the wood distillation products gradually declined in importance and were completely displaced by about 1930 as a result of cheap synthetic products or substitutes developed during this period. At that time, the foundry industry in India was not sufficiently developed or specialised to ensure a steady remunerative price for the charcoal pig iron produced at Bhadravati. Therefore, for the utilisation of pig iron locally, a vertically cast pipe plant was established in 1927 with a capacity of 10,000 tons per annum. For some years, this charcoal pig iron had an export market in the United States. Dr. M. Visvesvaraya has stated as follows:—

> "We were selling charcoal pig iron in the east coast districts of America about the year 1926 at the rate of about 5,000 tons a year. We were

> able to do this cheaper than American local manufactured charcoal pig iron after paying freight and other incidental charges by rail and steamer all the way from India."

He however adds that during his visit to America in 1926 and discussion with authorities in Washington, he got the impression that they were not keen on importing more than this quantity of 5,000 tons of pig iron per annum from Bhadravati.

First phase

2.2. Dr. M. Visvesvaraya was Dewan of Mysore from 1912 to 1919. About the year 1916, the Government of Mysore decided to establish initially a small iron works at Bhadravati, after about eighteen months of investigations, with which Mr. C. P. Perin, the American Steel Expert of the Tata Iron and Steel Co. at Jamshedpur, was associated. A scheme was worked out for the manufacture of charcoal pig iron because coal and coke were not readily available nearby. Shri Kasturbhai Lalbhai in his report (1951) to the Government of India, Ministry of States, on the State-owned and State-aided industrial concerns in Mysore, has stated as follows:—

> "The Mysore Iron and Steel Works were established in the year 1918 and the production of pig iron commenced in 1923. The erection and operation of the plant were initially entrusted to the Tata Iron and Steel Company who were the Managing Agents of the Works. Within a year of the commencement of production, the Managing Agency was terminated and the entire administrative responsibility was taken over by the State Government itself."

Dr. M. Visvesvaraya was in charge of the Works for about 6 years from March 1923. Regarding the first phase of development of the Iron Works at Bhadravati, Kasturbhai Lalbhai has written in his report of 1951 as follows:—

> "Originally, the plant consisted of a blast furnace with a rated capacity of 60 tons a day and a chemical unit for wood distillation. The capacity was subsequently increased to 80 tons of pig iron a day. The blast furnance was specially

designed for charcoal smelting, as coal was not available locally; and it was expected that the bye-products obtained from wood distillation would compensate for the high cost involved in the use of charcoal. The expectation did not materialise and this resulted in the shutting down of the carbonisation plant. Thereafter, charcoal was produced directly in the woods whereby all bye-products were lost. The production of pig iron thus remained unremunerative, and in an effort to make the concern remunerative, the Works were expanded in various directions. The following are the different projects which were undertaken from time to time:—

(*a*) *Pipe Foundry*—

Installed in 1926 to produce about 30 to 35 tons of cast iron pipes per day. Nearly 60 per cent of the output is earmarked for supply to the Government of India.

(*b*) *Rod and Strip Mill*—

For the manufacture of wire rods and baling hoops. The mill was installed in 1942 and operations started in 1946.

(*c*) *Steel Plant*—

Some surplus of pig iron was left over after the production of C.I. pipes. To handle the surplus and at the same time ensure a better balance of operations, a steel plant for the manufacture of mild steels by the 'Open Hearth' process was installed in 1934. Production of flats, rounds, square bars, angles, etc., started in 1936.

(*d*) *Cement Plant*—

To utilise the blast furnace slag, a cement plant with a capacity of 60 tons per day was added in 1947. The slag has not however been made use of at all but only clay, sand and lime-stone which are available nearby.

(*e*) *Ferro-silicon Plant*—

The ferro-silicon plant, which is stated to be the first of its kind in India, was installed at Mysore in 1942 with the assistance of the Government of India. Ferro-silicon is an essential ingredient in the manufacture of steel. Mysore was chosen in view of the availability of electric energy".

(Two ferro-silicon furnaces of 1,500 kva each with a total production of about 2,000 tons per annum were located in Mysore and later shifted to Bhadravathi).

"Even supplies of charcoal became inadequate during the war time and the management had to resort to the use of coke from 1945. This aggravated the position inasmuch as the blast furnace plant specially designed for charcoal smelting yielded unsatisfactory results when coke or its mixture with charcoal was used. The reduced output coupled with freight charges on coke, etc., contributed to the increased cost of production which was twice as high as pig iron produced at Jamshedpur. For some time to come, the management proposes to produce pig iron by the use of coke mixed with charcoal.

Practically, the entire quantity of pig iron produced is consumed in the general and pipe foundries and the open hearth furnace; and an additional quantity of 10,000 tons pig iron is procured annually from other sources to meet the requirements. Besides, steel scrap to the extent of 21,000 tons is also required, of which only about 8,000 tons are available at the Works. The remainder of the scrap is collected from all over South India, and some assistance is being given by the Government of India in collecting scrap for re-melting and preventing diversion for other purposes.

> In view of all the handicaps the concern was not able to make any profits or make any provision for depreciation up to 1934-35. During the subsequent period of four years from 1935-36 to 1938-39, a nominal provision for depreciation was made (Rs. 7 lakhs in all) but there was no return on the capital invested. It was only the outbreak of the war in 1939-40 which enabled the concern to make proper provision for depreciation. Taking the war period as a whole there was a net surplus, after providing for depreciation only from 1942-43 onwards; but if interest at 4 per cent on the Government capital invested is taken into account, the net surplus will be converted into a net loss except during the three years 1942-43, 1944-45 and 1945-46. Even now, the Works have not retrieved the position sufficiently to give a return of 4 per cent on the capital".

There were about 4,000 people working at MISL, Bhadravathi, when the above report was published in 1951. Those projects which were implemented before and during the Second World War constitute what may be described as the first phase of development of MISL.

Second phase.

2.3. The second phase of development consisted of:—

(1) Two electric pig iron furnaces (60,000 tons additional production capacity),

(2) Additional cement kiln (60,000 tons additional production capacity),

(3) Ferro-silicon plant (5,000 tons additional production capacity),

(4) Acetic acid plant (600 tons capacity), and

(5) Improvement and expansion of foundries and tramways.

The implementation of this programme increased the capital investment from Rs. 2.8 crores in 1945 to Rs. 6.1 crores in 1955. Shri Kasturbhai Lalbhai commenting on these developments in his report has said that :—

> " The electric pig iron furnaces have been installed with the object of utilising the cheap power available from the Jog Project. It is expected that this will enable the concern to market the pig iron at about Rs. 130 that is Rs. 20 per ton lower than the present price of Rs. 150 but even then, the electric pig iron will be at least Rs. 10 per ton costlier than pig iron from Jamshedpur delivered in the State, as the electric furnaces will still have to use coal and coke for reduction purposes to the extent of 55 per cent of the total energy consumed. The pig iron cannot, therefore, be marketed as such. For this reason and also for putting to a good use the additional power which would soon be available when the Jog Project is completed, the Mysore Government are thinking of installing an additional steel plant and also auxiliary plants for manufacture of alloys, wire and wire products, seamless tube, etc. These schemes would cost another sum of Rs. 3.6 crores over a period of five years. It is not expected, however, that the production costs will be competitive even after the scale of activities have been enlarged."

Regarding the expansion of the Cement Plant Shri Kasturbhai Lalbhai has stated thus :

> ". To utilise to best advantage the surplus blast furnace slag from the electric pig iron furnaces, it is proposed to expand the existing productive capacity of the Cement Plant (60 tons) by an additional 200 tons per day (*i.e.*, a total of 80,000 to 1,00,000 tons per annum). The Cement Plant which has just been duplicated at a cost of Rs. 72 lakhs is not expected to bring down the production cost, since any economy effected by working the old and new plants side by side will be more than counter-balanced by the higher capital cost of the new plant."

Regarding the Acetic Acid Plant, Shri Kasturbhai writes :

> "The working results of the Wood-Distillation Plant have been disappointing. To avoid the recurring losses, it is proposed to instal an up-to-date Acetic Acid Plant with a productive capacity of 2 tons of acid per day."

In the Chapter on "The Mysore Iron and Steel Works, Bhadravati" of the Report dated 18th February 1951, Shri Kasturbhai Lalbhai has suggested that due care should be given to the proper planning of the expansion programmes.

> "The Expansion Schemes already taken up have made the Works unduly congested and I hope that before taking up any new projects, the need for proper planning of the layout will receive careful attention and that adequate provision will be made for future expansion also."

Third phase.

2.4. Developments during the Second and Third Five-Year Plan periods may be taken as the third phase of the development of MISL.

During the Second Plan period, steel production in the country was to be stepped up to 6 million tons, from 1.5 million tons at the end of the First Plan. The following programme of expansion was drawn up for MISL, Bhadravati, estimated at Rs. 11.55 crores.

		Capacity	*Rs. in Crores*
1.	Expansion in steel production capacity	1,00,000 Tons.	3.00
2.	Ferro alloys, ferro silicon, etc ..	25,000 ,,	1.50
3.	Stainless steel ..	15,000 ,,	4.50
4.	Tool & alloy steel ..	2,000 ,,	1.10
5.	Extension to foundries, etc. ..	..	1.00
6.	Spun pipe and sintering plant, etc ..	..	0.45
	Total ..		11.55

Of this programme, only the spun pipe plant was completed during the Second Five-Year Plan period. It was commissioned in 1958 at a cost of Rs. 45 lakhs.

By the end of the Third Five-Year Plan period, the programme of expanding the steel production capacity by 1,00,000 tons was completed at a total cost of Rs. 12 crores. Two 12-ton LD converters with a

total capacity of 80,000 tons per annum were installed in 1965. One 20-ton electric arc furnace with a capacity of 20,000 tons per annum was also installed in the same year. A new Rolling Mill to roll about 80,000 tons of finished steel was also commissioned in 1965. It may be recalled that in the first phase of development, two Open Hearth steel furnaces were commissioned in the year 1936 with a total capacity of 45,000 tons per annum, along with a Rolling Mill with a capacity of about 30,000 tons of finished steel. A Strip and Rod Mill which was installed in 1942 and started operation in 1946 had a capacity of 13,000 tons. A 6-ton electric arc furnace was installed in 1965 as part of the third phase expansion (apart from a 3½ ton electric arc furnace which had been installed in 1941). The second 20-ton arc furnace and a 8-ton arc furnace were commissioned in 1967 and 1968 respectively. A complete list of the production units installed along with the capacity and cost and date and year of installation is given in Table No. 1. The programme for Stainless Steel and Tool and Alloy Steel mentioned above were not implemented. These would have been highly profitable units if they had been installed as programmed. On the other hand the mild steel expansion programme, by its very nature and small scale of operations compared to the big steel plants could not be competitive. Moreover the third stage expansion programme estimated to cost Rs. 11.55 crores in 1954 including Rs. 5.6 crores on stainless steel and tool and alloy steel ultimately costed Rs. 12.82 crores excluding the stainless steel and tool and alloy steel programme. Break up of actual investment on certain items as compared to what was originally envisaged, was as follows :

	Estimate	*Actuals*	*Increase*
		(*Rs. in Crores*)	
Expansion in steel production capacity (by 1 lakh tons).	3.00	10.75	7.75
Ferro alloys, ferro silicon, etc. ..	1.50	1.01	(—) 0.49
Extension to foundries, etc., spun pipe and sintering plant, etc.	1.45	1.06	(—) 0.39
Total ..	5.95	12.82	6.87

The mild steel expansion itself costed more than three times the original figure because there was a gap of more than ten years between the original idea and esti-

mate (1954) and the eventual completion of this programme in 1965.

Conversion to alloy steel plant suggested by Union Minister for Steel.

2.5. Shri C. Subramaniam, Union Minister for Steel and Heavy Industries, while inaugurating the new Ferro Silicon Plant on 16th June 1962, suggested that MISL should actively consider the conversion of the common steel production into special steels, in view of the fact that steel plants with larger capacities of common steel had been started in the public sector, besides the expansion of the existing major steel plants in the private sector. Shri C. Subramaniam is also stated to have further suggested that MISL, Bhadravati, might consider going in for an alloy steel production of 1,00,000 tons by converting the expanded steel plant completely into alloy steel plant. According to the official papers of the Company, this was the reaction of Shri C. Subramaniam, Union Minister for Steel, at the time of the inauguration of the new Ferro Silicon Plant on 16th June 1962, when he was appraised of the Company's proposal, as per Board Resolution, dated 1st May 1962, to request the Government of India for grant of loan assistance of Rs. 8.7 crores, consisting of Rs. 7.2 crores for alloy steel plant of 15,000 tons capacity and Rs. 1.5 crores for new pig iron furnaces of additional 1,20,000 tons capacity.

Demag proposa (1962).

2.6. In pursuance of the suggestion made by the Union Minister for Steel, Shri C. Subramaniam, that the MISL should be converted completely into an alloy steel plant, proposals were obtained from Messrs. Demag for such a conversion.

Messrs. Demag in their project report of August 1962 proposed a conversion programme in three stages.

	Alloy steel ingot	*Finished alloy and special steel*	*Common steel ingot*	*Finished common steel*
	Tons.	Tons.	Tons.	Tons.
First stage ..	56,000	42,000	48,000	38,000
Second stage ..	1,06,000	77,000 (including 5,000 tons forging)	..	..
Third stage ..	1,06,000	75,000 (including 8,000 tons forging)	40,000	36,000

It will be seen that in the second stage there was to be a production of 77,000 tons of only alloy and special steels though, in the third stage, 36,000 tons of finished mild steel was contemplated in addition to 75,000 tons of special steels. The additional foreign equipment required during the first and the second stage of expansions were estimated at Rs. 2.28 crores and Rs. 3.07 crores respectively. The break-up was as follows :—

	D. M. (millions)	*Rupee equivalent (millions)*
Foreign equipment for first stage.—		
1. One 500 tons shear with auxiliaries ..	11.65	13.87
2. Laboratory for alloy steel production ..	1.50	1.78
3. Finishing department, dressing shop, etc. ..	6.00	7.14
Total ..	19.15	22.79
Foreign equipment required for second stage.—		
1. Combined merchant bar mill-complete ..	20.56	24.45
2. Equipment and plant for melting operations	5.21	6.21
Total ..	25.77	30.66

2.7. In September 1962 the Company proposed that the expansion contemplated at the end of the third stage could be attained by the end of the second stage itself by installing an additional pig iron capacity of 1,20,000 tons and this entire conversion programme was estimated to cost only Rs. 10 crores including Rs. 1.5 crores for the two new pig iron furnaces of 1,20,000 tons total capacity. The break-up of this estimate was as follows: MISL's Rs. 10 crores programme, 1962.

	(Rs. in crores)
Foreign exchange component ..	6.40
Rupee expenditure—consultancy fees	2.21
Local works ..	2.10
Total ..	10.71

It was expected that this programme could be completed by December 1964 if expeditiously implemented. It may be recalled that the rupee was

devalued by 57½ per cent in June 1966. However, the estimated capital investment of Rs. 10 crores for this conversion appears to have been on the low side. As a matter of fact this programme is now estimated to cost Rs. 36 crores; of which Rs. 22 crores had been spent by March 1968, leaving a balance of Rs. 14 crores. The break-up of this Rs. 22 crores and balance requirement of Rs. 14 crores are given in Table No. 2. It is interesting to note that the additional pig iron capacity of 1,20,000 tons was against a marginal anticipated shortfall in internal supply of about 15,000 tons of pig iron even after providing for 36,000 tons of mild steel sections (apart from 75,000 tons of finished alloy and special steels) as envisaged in the Demag programme, in the third stage. There would be no shortfall in internal supply of pig iron if there was to be no mild steel production programme as in the Demag second stage. In other words the production of pig iron from the new electric pig iron furnaces would be mostly for sale outside the plant. Even the marginal pig iron shortfall assumed that the L.D. Converters would be worked to full capacity and their production duplexed into the electric arc furnaces for the production of alloy and special steels. It may be recalled that the L.D. Converters were part of the earlier mild steel expansion programme contemplated in 1954 and actually completed in 1965. However work on the L.D. Converters had begun in February 1962 and, as stated above, the conversion programme into alloy steels was thought of during June/September 1962.

Industrial licence & production.

2.8. The industrial licence issued on 20th December 1960 is for the following products:

	Type of Steel	*Capacity*
		Tons
1.	High Speed Steel	3,850
2.	Alloy Tool and Die Steels ..	2,000
3.	Tool Steels	3,000
4.	Constructional Steels	31,600
5.	Stainless Steels	3,000
6.	High grade Alloy Steels	3,550
7.	Free cutting and Spring Steels ..	30,000
	Total ..	77,000

However, as against this, the actual production of alloy and Special steel was only about 7,789 tons in 1967-68 and 16,317 tons in 1968-69 (apart from mild steel production of 72,454 and 70,711 tons in 1967-68 and 1968-69 respectively). The Company expects production of alloy and special steels to go up to 45,000 tons during 1969-70. It is significant to note that the conversion programme which was contemplated in 1962 has still not been completed and full financial arrangements for this programme are yet to be made. Careful planning and correct decisions are needed to complete the conversion of MISL into a full-fledged competitive alloy steel plant under the present conditions. This is discussed in greater detail in Chapter VI on Production and Productivity.

Investment production & sale value.

2.9. Particulars regarding the growth of investment, total value of production, total sale value, total number of persons employed and sale value per man-day from 1930 to 1969 are as follows:

	Total Investment	*Total Production value*	*Total Sale value.*	*Total No. of persons employed*	*Sale value per man-day*
		(Rs. in lakhs)			Rs.
1930	124	17	13	N.A.*	..
1940	170	54	75	N.A.*	..
1955	650	267	308	6,486	13
1965	1,620	750	855	9,497	24.7
1968-69	4,386	1,019	1,229	9,756	35

*Not available.

The figures regarding employment include all the persons working in the different units of MISL including the Kemmangundi Mines, Cement and Ferro-Alloys Plants and the Iron and Steel Units. The total production and sale values also correspondingly include sale of cement and ferro-alloys in addition to iron and steel. These figures represent the total working of the MISL in very broad terms. Though the sale value per man-day shows an increase, the production and sale values have consistently lagged behind the total cumulative investment. The ratio between annual turn over and total investment should normally range from 1 : 1 to 2 : 1 but in the case of MISL, the ratio of turn over to investment has been approximately 1 : 2 from 1955 onwards.

CHAPTER III

Production and Demand for Steel

MISL and the steel industry.

3.1. It is necessary to study the growth of production and demand for steel in India in order to understand the logic of this development and the basis of estimates of future demand, in the context of which the Indian steel industry is being planned. It is only against such a background that we can fully understand and appreciate the growth of the Mysore Iron and Steel Ltd. (MISL) at Bhadravati, and make a realistic assessment of the quantitative and qualitative role that the MISL can play in the future development of India's steel industry. It is desirable to look at MISL and its problems in the context of the totality of the steel industry in India and its technological trends; otherwise our thinking regarding MISL is likely to be restricted, isolated and out of tune with the times. In the past, there has been a tendency to plan for MISL without fully taking into account the economic and technological implications of the planned development and growth of large size steel plants in the country.

Pre-war period.

3.2. As early as 1899 Tata thought of erecting the first steel mill in India. In 1906 a site was chosen at Sakchi in Southern Bihar which is now Jamshedpur, the Headquarters of Tata Iron and Steel Company (TISCO). Unlike MISL, Bhadravati, TISCO was a coke and not charcoal based plant. It was designed to produce steel to meet the needs of the growing Indian market and not pig iron for export. Its location was determined by the availability of important raw materials to ensure its continued expansion and competitive growth. The Indian Iron and Steel Company (IISCO) was founded in 1918 and later erected a steel plant at Burnpur, though at first IISCO manufactured pig iron primarily for export to United Kingdom and Japan. IISCO also had the natural advantage of favourable location with regard to availability of important raw materials and transport. The Mysore Iron and Steel Works at Bhadravati was thought of and founded in the years 1916-18 and went into production in 1923. This was a small charcoal-based

plant whose growth has been largely limited by its great distance from coal fields and problems of transport. Even today there is only a metre-gauge railway line at Bhadravati. Its subsequent growth has been based on the use of electricity in order to minimise the use of coke. However, in the absence of any special policy protection for electricity-based production of pig iron and steel, except indirectly during the period of differential retention prices, MISL found it increasingly difficult to compete with large sized coke-based steel plants in the North-East region of India.

During the pre-war period the growth of the Indian steel industry is closely connected with these three steel plants, two in the private sector, and the one at Bhadravati, fully Government owned. TISCO made rapid progress. It achieved an average rate of growth in its capacity of about eight per cent per annum during the first 30 years. TISCO's capacity which was only 1,00,000 tons in 1912 increased to 8,00,000 tons of finished steel in 1939 which was 75 per cent of the total steel consumed in India at that time. Purchase of TISCO's steel output by Government owned Railways helped in its growth during the early years. It may be noted that the Mysore Iron and Steel Works did not produce steel prior to 1936. The production, import, export and consumption of saleable steel and the percentage of TISCO and MISL production to consumption of steel in India, during the years 1920-21, 1925-26, 1931-32, 1937-38 and 1938-39 were approximately as follows:

(In thousand tons)

Year	Production		Imports	Exports	Consumption	Percentage of production to consumption		Percentage of imports to consumption
	TISCO	MISL				TISCO	MISL	
1	2	3	4	5	6	7	8	9
1920—21 ..	122	..	770	1	891	14	..	86
1925—26 ..	320	..	915	1	1234	26	..	74
1931—32 ..	456	..	369	15	810	56	..	46
1937—38 ..	674	15	365	26	1028	66	1.5	36
1938—39 ..	715	23	264	24	978	73	2.4	27

From the above figures, it will be seen that during the pre-war period, TISCO's production as percentage of total consumption of steel in India increased progressively, while the percentage of imports to total consumption decreased correspondingly. MISL's steel production was and still continues to be a very small proportion of the total production and consumption of steel in India.

3.3. Figures of production, import, export and consumption of saleable steel for the post-war period from 1945 onwards are given in Table No. 3. During the immediate post-war period, 1945-50, the total annual production of steel in the country was less than a million tons. Of the average annual production of 9.35 lakh tons during 1945-50, TISCO's percentage was 77, IISCO's 20 and MISL's 3. The average imports during this period was 1.87 lakh tons per annum, which was 17 per cent of the average consumption of 11.12 lakh tons per annum. Post-war.

The corresponding figures for the next five-year period, 1950-55, are as follows :

Of the average annual production of 11.4 lakh tons, TISCO's percentage was 70, IISCO's 27 and MISL's 3. The average imports during this period was three lakh tons per annum which was 21 per cent of the average consumption of 14.3 lakh tons per annum. It will be seen that while the total production of saleable steel in the country exceeded 1 million tons, the total consumption of steel also increased, as a result of which the percentage of average production to average consumption did not change very much.

However from 1955 onwards there was a sizable increase in steel consumption which could not be

quickly matched by increased production. There was a sharp increase in imports from 1955-56 onwards.

	Average annual production (in lakh tons).	Percentage of average annual production of			
		TISCO	IISCO	MISL	HSL
1	2	3	4	5	6
1955—60 ..	14.6	62	34	3	1
1960—65 ..	37.9	37	20	1.0	42

	Average Imports	Average consumption	Average imports as percentage of average consumption.
	(in lakh tons)		
	7	8	9
1955—60 ..	12.8	27.4	46
1960—65 ..	11.2	48.4	23

These figures clearly indicate that to avoid the sharp increase in steel imports during the Second Plan period, steps would have had to be taken immediately after the II World War to increase internal production of steel, especially as steel production has a long gestation period of 5 to 7 years. Even during the Third Plan period, internal production was inadequate to meet the requirements of the country and there was continued dependence on imports of steel though to a less extent than for the period 1955-60. Therefore the decade 1955-65 may be generally described as a period of steel shortages.

It is significant to note that the HSL started producing steel only in 1959-60. During the First Plan period the only increase in steel production was as a result of IISCO's expansion programme. TISCO also had undertaken some new investments to improve their plant and equipment which had deteriorated since the outbreak of the war. The MISL production did not increase very much compared to the earlier period. However preparations for the construction of three new

public sector steel mills may be said to have taken some shape by the end of the First Plan period. It is only during the middle of the Second Plan period (1959-60) that these three public sector steel plants at Rourkela, Bhilai and Durgapur went into production, about 12 years after Independence. The Estimates Committee of the Lok Sabha in its 33rd Report (1958-59) on the Ministry of Steel, Mines and Fuel has indicated that the investment cost of steel plants immediately after the Second World War would have been about 50 to 60 per cent less than the steel plants eventually erected in India during the latter half of the 1950's. The investment cost has continued to increase in subsequent years. The bulk of the foreign exchange required for the three public sector steel plants at Rourkela, Bhilai and Durgapur were by way of loans from West Germany, Soviet Russia and British Governments respectively. TISCO and IISCO also expanded their production during the Second Plan period, apart from the expansion undertaken during the First Plan. William A. Johnson in his book on the Steel Industry of India writes: "With the exception of a long deferred but inconsequential expansion of MISL all programmes for increasing the industry's capacity were fully or largely completed by the end of the plan period" (Second Plan).

It may be noted that the MISL's programme of expanding mild steel production capacity by one lakh tons was completed only by the end of the Third Five-Year Plan, by which time the decade of acute steel shortages was largely over and surpluses had started emerging in certain categories of steel. During the Third Plan period, the three public sector steel plants which had commenced production in 1959-60, further expanded their production and a fourth steel plant was contemplated at Bokaro. If MISL had completed expansion programme by the middle of the Second Plan period along with the other public sector steel plants, it could have had the advantage of the differential retention prices upto 1962, and fairly workable cost-price ratio for steel, due to shortages, upto 1965. This would have enabled MISL to stabilise its financial position. It may be recalled that differential retention

prices were in existence from 1949 to 1962 and thereafter small secondary steel producers including MISL were allowed to sell steel at open market prices which could be higher than the Joint Plant Committee (JPC) prices applicable only to the major steel producers.

William A. Johnson writing about the pre-war period of the steel industry in India states that: "By 1939 TISCO's Mill, one of the largest steel mills in the British Empire, was also one of the lowest cost producers in the world..... India's achievement of virtual self-sufficiency in steel and her production at relatively low cost is a very good evidence that India possesses a comparative advantage in the production of steel". This statement regarding near self-sufficiency in steel applies to the pre-war period of very low economic development in the country. In the post-war period the demand for steel increased greatly and significant technological developments took place, having an effect on the investment and cost of production of steel in the different steel producing countries of the world.

Plan targets and production,

3.4. At the end of the First Five-Year Plan the annual steel production capacity in India was only 1.5 million tons. The *per capita* consumption of steel was as low as 1.5 kg. per head. Comparative figures of *per capita* consumption of steel in 1960 and 1964 in various countries are given in Table No. 4. Therefore, the target for steel production during the Second Five-Year Plan was fixed at 6 million tons. Direct investment in India's integrated steel plants amounted to 11 per cent of the aggregate plan outlay during the Second Plan period. Investment in the industry during the Third Plan period was to be of the order of 6 per cent of the total planned investment. The steel production target at the end of the Third Plan was at first 18 million tons which was subsequently scaled down to about 10 million tons.

However for 1967-68 the production of ingot steel and saleable steel in the country was 6.2 million tons and 4.6 million tons respectively. Expansion of Bhilai Steel Plant from 1 to 2.5 million tons has been completed and further expansion to 3.2 million tons is under way. Expansion of Rourkela Steel Plant to

1.8 million tons is also under way and that of Durgapur Steel Plant to 1.6 million tons is respected to be completed soon. TISCO's production is about 2 million tons and IISCO's is a little less than a million tons. MISL's steel production in 1967-68 was 92,220 tons. All this amounts to a total of about 10 million tons apart from Bokaro which is expected to produce 1.7 million tons of ingot steel and 0.88 million tons of foundry grade pig iron in the first stage. Bokaro's first stage production of 1.7 million tons of ingot steel is to be rolled into 1.3 million tons of finished steel consisting of hot and cold rolled plates, sheets and coils. Eventually Bokaro's steel production capacity is to be stepped up to 4 million tons of ingot steel.

As regards alloy steel most of the units of the integrated alloy steel plant at Durgapur have already been commissioned. This plant has an initial annual capacity of 100,000 tons of ingots with a provision to expand ultimately to 300,000 tons. From the initial 100,000 tons of ingots, about 60,000 tons of finished steel will be rolled annually. The initial planned product-mix of the Durgapur Alloy Steel Plant is as given below though their actual production is much less:

Grades	*Forgings*	*Bars*	*Sheets*	*Total*
1. High Speed Steels ..	350	1,500	400	2,250
2. Alloy, Tool & Die Steels.	..	3,600	..	3,600
3. Carbon Tool Steels	..	8,500	1,000	9,500
4. Constructional Steels	3,000	22,650	1,000	26,650
5. Stainless Steels ..	..	3,000	15,000	18,000
Total ..	3,350	39,250	17,400	60,000

3.5. The four Public Sector Steel Plants including Durgapur Alloy Steel Plant (excluding the Bokaro Steel Plant which is under construction) are under the management of Hindustan Steel Limited. This huge public sector enterprise which was started with an initial capital of about Rs. 300 crores, is at present the HSL

largest industrial enterprise in India with a capital outlay of more than Rs. 1,000 crores. While the capital investment in the integrated public sector steel plants including the Alloy Steel Plant at Durgapur was of the order of Rs. 1,000 crores, the production of saleable steel in 1966-67, 1967-68 and 1968-69 was of the order of 4.3, 4.63 and 4.72 million tons respectively. This is a tremendous task which requires not only capital but trained personnel. Hindustan Steel Limited (HSL) claims to have sent over 2,000 technicians abroad for training in advanced steel technology. In the technical institutes at Rourkela, Bhilai and Durgapur, hundreds of young Indians are trained to become skilled technicians in steel technology. Our Committee was impressed by the large number of keen and well qualified young technicians working at these steel plants. The three integrated steel plants and the Alloy Steel Plant of HSL employ more than 100,000 men. The total number of living quarters in all the pant townships is over 50,000. Other amenities have also been provided. Sales of HSL have grown from Rs. 1.7 million in 1958-59 to about Rs. 2,330 million or Rs. 233 crores in 1966-67. With the completion of the expansion programmes under way, the total sale value is expected to increase and compare more favourably with the total investment.

The Central Engineering and Designs Bureau (CEDB) of HSL is expected to plan and design for the future. It is located at Ranchi with site offices at Durgapur, Rourkela and Bhilai. The personnel of the CEDB is expected to gain valuable experience in the process of the expansion of the public sector steel units. It is necessary for every steel plant including MISL to have a planning, development and design cell in keeping with its size and requirements in order to keep in touch with the latest developments in the field and make intelligent use of a developing modern technology to suit its own needs. It is also necessary to develop suitable technical capabilities on a systematic and planned basis and keep in close touch with different technical organisations so that there is valuable exchange of experience and fuller utilisation

of available technical know-how in the solution of pressing problems that are bound to arise as we progress and try to become more self-reliant.

Need for relationship between MISL and HSL.

3.6. There is no reason why the MISL should not have an arrangement with the HSL by which the CEDB has a branch office at Bhadravati as well. This will enable MISL to be in touch with the technical thinking of the bulk of steel industry in India. In view of MISL's plans for complete conversion to alloy and special steels production of about 75,000 tons to 100,000 tons per annum, MISL becomes one of the most important alloy and special steels producing units in the country. Since both Durgapur Alloy Plant and MISL are working in the same field of alloy and special steels, it is obvious that there should be a close working relationship between the two so that their production, planning and sales policy are complementary and mutually beneficial.

It is desirable that a high-powered team including the General Manager of the Durgapur Alloy Steel Plant and some other senior executives from HSL and other steel plants should be invited to visit MISL, Bhadravati, for an on the spot study and discussions, in order to fully explore the manner in which MISL could profitably function by concentrating on those areas of production in which it may have a special advantage. Similarly the top technical and administrative personnel of MISL should visit other steel plants in order to further strengthen the bonds of technical and economic relationship for the purpose stated above. It would be very useful for MISL to have some relationship with the HSL on a permanent basis so that each takes into account the programmes of the other in planning for the future. Such a co-operative approach is very essential for the proper development of MISL, Bhadravati, and the alloy and special steels industry in India.

Demand projections

3.7. The National Council of Applied Economic Research (NCAER) have made long term projections for iron and steel in India in their publication of September 1968. Their estimation of the total

domestic demand for the four main products covered in their study are as follows :

	Mild Steel		*Foundry grade pig iron*	*Alloys and Special Steels (Rolled)*	*Ferro-Alloys*
	Ingots	*Finished steel.*			
				(*In million tons*)	
1970-71	9.55	7.12	1.79	0.38	0.17
1975-76	14.10	10.51	2.39	0.58	0.24
1980-81	20.50	15.37	3.48	0.87	0.34

It may be recalled that the ingot and finished steel production in the country for 1967-68 was 6.2 million and 4.6 million tons respectively. The ingot steel production in the country is expected to go up to 10 million tons after the present expansion programmes have been completed. It will become 14 million tons if the full 4 million tons production planned at Bokaro is achieved. The yield rates for conversion of ingot to finished steel are taken as 69 per cent for flat products and 78 per cent for non-flat products. The estimated demand figures for alloy and special steels include 60 per cent alloy steels, the rest being special steels like free cutting steel, electrical steel, etc. The demand estimate figures for 1970-71 and 1975-76 are based on an analysis of the end-uses of each of the above four products in the different economic sectors and sub-sectors. However, the estimates for 1980-81 are based on some broad considerations and calculations as a detailed end-use method was not practicable at that distance of time. Some further details regarding the basis of the NCAER steel demand, estimates and projections are given in Appendix IV.

The Steering Group on Iron and Steel of the Ministry of Steel and Heavy Engineering, Government of India, in its Report of February 1969, however modified the NCAER estimates by assuming that, due to decline in domestic consumption of steel from 5.36 million tons in 1964-65 to 4.032 million tons in 1967-68, the NCAER targets for 1970-71 and 1975-76 would be achieved only by 1973-74 and 1978-79 respectively. The estimated domestic demand for finished steel at the end of 4th and 5th Plans, *i.e.*, 1973-74 and 1978-79

was put at 7.12 million and 10.97 million tons respectively.

According to the Steering Group of the Ministry of Steel the existing capacity of both the integrated steel plants and secondary producers is 7.05 million tons of finished steel and 1.27 millions tons of pig iron. The availability which can be taken into account would be 6.346 million tons of finished steel and 1.143 million tons of pig iron. This will be short of requirements for domestic demand plus planned exports by about 2 million tons of finished steel (in 1973-74). Taking into account the technological improvements, IISCO's expansion and the sixth blast furnace at Bhilai, and Bokaro's completion of first stage by the 4th Plan, the availability will increase to 7.824 million tons of finished steel leaving a gap of about half a million tons. In 1978-79 the gap is expected to be of the order of about 3 million tons of finished steel. The Steering Group expects that a portion of this gap would be met by installation of electric furnace-*cum*-continuous casting plants.

The NCAER has stressed that a balance sheet of supply and demand for steel should be drawn up not only in terms of overall aggregates but also in terms of different categories of steel. Categorywise analysis of supply and demand becomes all the more crucial and critical in alloy and special steels with which MISL, Bhadravati, would be mainly concerned after completing its conversion into an alloy and special steel plant. The NCAER estimates of the supply of steel in 1970-71 do not include the MISL production of mild steel. The NCAER specifically omitted the MISL production because as they put it " this unit although producing some mild steel now is to be switched over completely to alloy steel production after all the new production facilities are established ". The NCAER states that " In 1970-71 there will be excess capacity in all non-flat products. On the other hand, except for skelp, there are substantial gaps in the flat products, of 1.153 million tons in 1970-71 ". This only indicates that MISL, Bhadravati, should complete its conversion to alloy and special steels without any further delay. At present MISL is producing more of mild steel.

Need for new steel plant.

3.8. So far as the ordinary steel is concerned, the implication of the NCAER study is that the existing capacities together with the present contemplated expansions of HSCO and Bokaro stages I and II will be adequate to take care of the anticipated demand in 1975-76. It is only in the five-year period ending 1980-81 that a new integrated steel plant will be required to meet the steel demand which is anticipated to increase by about 5 million tons in this period. Assuming a gestation period of 5 to 7 years, it would be necessary to plan the commencement of a new integrated steel plant during the period 1970-75. In this context it is obvious that the need to locate the next steel plant in the Sandur-Hospet region should be adequately stressed. The report of the Steering Group on Iron and Steel of the Ministry of Steel, prepared in February 1969 states that "In view of the minimum period of 7 years required to bring a new steel project to position, from the date of commencement, it would be necessary to take up a new integrated steel plant almost immediately."

The Steering Group in its recent report also discussed the economics of medium-size steel plants of 1 to 2 million tons capacity which would serve as a nucleus for further development. It is argued that the development of continuous casting technology, with wide range of economic capacities, would enable the starting of steel plants of different sizes for maximum utilisation of capacities in the shortest possible time and expansion from earnings. One of the major factors which favoured the setting up of large steel units was the minimum economic-sized primary conventional rolling mill. This resulted in large in-built capacity which remained under-utilised over a long period. In this context it is interesting to note that in Japan the trend is to use very large blast furnaces as compared to our blast furnaces of a capacity of 1,000 to 1,500 tons per day. Japan has installed blast furnaces of 5,000 to 7,000 tons per day capacity and the technological advantages of continuous casting would also be available to them. However at the Bokaro Steel Plant, which is under construction, continuous casting has not been thought of.

The Steering Group has also drawn pointed attention to the quality of raw materials for the development of the steel industry. For instance, it is pointed out that the ash content in the coking coal has gone up from about 15 to 16 per cent to about 20 to 22 per cent over the last decade. For every 1 per cent increase in ash content, there is a reduction in production of hot metal by about 3 to 6 per cent and corresponding increase in the cost of production which amounts to about Rs. 30 to 40 per ton as compared to the use of superior coal. The strength of the Japan's steel industry lies in the quality and use of raw materials. Therefore the Steering Group has suggested that the import of superior coking coal may be justified by the reduction in costs and corresponding increase in exports that could be expected. The logic of this argument is that future steel plants need not be located near the traditional coal fields but near rich deposits of iron ore.

The Steering Group in its report has estimated that during the 5th Plan period the investment towards the completion of two new integrated steel plants to be started earlier would be of the order of Rs. 497 crores apart from Rs. 190 crores required for completing Bokaro's 4 million tons production. "Plant I is projected to produce 1.68 million tons of finished steel and 400,000 tons of saleable pig iron. It is proposed that Plant II will produce 700,000 tons of finished steel with 830,000 tons of saleable pig iron. The product-mix for the two plants will include universal beams, merchant bars, medium structurals, billets and sleepers. The plants will be better suited for the export of these items as they would be located at deep sea ports".

Mysore Government should take due notice of the last sentence of the above paragraph from the summary and conclusions and recommendations of the Steering Group on Iron and Steel of the Government of India. The obvious question is what happens to the claims of Sandur—Hospet region for an integrated steel plant if both the new plants proposed during the 4th and 5th Five-Year Plans are to be located at deep sea ports.

Electric arc furnace and continuous casting.

3.9. With regard to electric arc furnace-*cum*-continuous castings units, the Steering Group has stated as follows: "The total production of steel from electric furnaces in the country is of the order of 2.5 per cent as against about 20 per cent in most of the developed countries such as U.K., U.S.A., Japan, etc. At the same time India has surplus scrap and is currently exporting scrap to the extent of about half million tons per annum mainly to Japan. The investment on the setting up of a electric furnace-*cum*-continuous casting unit is approximately 30-40 per cent of the investment cost per ton in the integrated steel plants".

"It is expected that production from electric furnace-*cum*-casting units will help to supply more billets to the re-rollers who have excess capacity at present and are engaged in the rolling of structurals, bars, rods, hoops, strips, wire rods and railway track materials. Re-rollers are also expected to modernise and diversify their production so as to produce such items as high tensile ribbed bars, inch sections, light structurals, special sections for towers for exports, window sections and special quality strips. The Steering Group was aware of "the number of difficulties which have been vitiating the development of this industry despite decontrol in the industry for licensing purposes. Further, the cost of electricity is higher. There is substantial excise duty on the steel produced from the electric furnaces and the price of some of the consumable stores like graphite electrodes is high compared to the imported electrodes. These factors need to be examined in detail and necessary remedial measures taken for the development of this industry". With this object in view the Department of Iron and Steel is getting a feasibility study prepared on the availability of suitable size scrap and for suggesting locations for setting up of electric furnaces-*cum*-continuous casting plants. This report is shortly awaited. In this context the economics of the use of sponge iron instead of scrap should also be carefully examined to determine their relative technical and cost advantages. The Steering Group has suggested a production target for this industry of 250,000 tons by 1973-74 and 350,000 tons by 1978-79. "There are no concrete proposals

at present except the 50,000 tons unit coming up in Madras".

The Steering Group has stated that "Much would depend on the decision of the Ministry of Finance on exemption from excise duty on steel produced in the electric furnaces. In case the private sector does not come forward to step up its capacity the Steering Group felt that it would be desirable for the Government to step in. It is in this context that an outlay of Rs. 17 crores with a foreign exchange component of Rs. 5 crores in the public sector has been suggested by the Steering Group. This would suffice only to the extent of adding about 1,15,000 tons capacity, over and above the 1,00,000 tons capacity either in existence or under implementation by 1973-74".

In view of this categorial statement by the Steering Group of the Government of India and the availability of electricity and rich iron ore deposits in Mysore State, Government of Mysore should immediately examine this matter in great detail and consider having a feasibility study made by experts. Government of India should also be pressed to take certain policy decisions with regard to the growth of electricity-based steel production in the country so that the economic feasibility of this development could be realistically assessed within such a policy framework. It is of vital importance to the State that Government of India lays down a realistic long term policy in this regard in the interests of diversification of the steel industry and due encouragement to electricity-based steel production. Without such a clear-cut policy framework it would be difficult to take concrete steps in this direction and much valuable time will be lost to the detriment of rich iron ore tracks in the southern region of the country and particularly Mysore State.

Pig iron.

3.10. As regards the demand and supply position for pig iron the NCAER estimates that "There will be an apparent gap of 5,05,000 tons in 1970-71, unless the first of Bokaro's blast furnace, which is reported to be only for foundry grade iron, comes up before that year and an output of 5,05,000 tons is achieved.

Assuming that Bokaro is in full production in 1975-76 there is still an apparent gap of 2,05,000 tons in 1975-76". A number of schemes have been licensed for the production of foundry grade pig iron in the private sector amounting to about 7,00,000 tons per annum. It is not known how many of these will materialise. The NCAER study states that "the progress on practically all of them is not very satisfactory. . . . Nevertheless at least one or two of these schemes should be implemented to close the gap. New facilities will have to be set up for foundry pig iron in the period beyond 1975-76 as demand during that period may increase by 1.1 million tons". However, in the Bellary District of Mysore State a 15,000 kva electric reduction furnace of the Sandur Manganese and Iron Ores has commenced production from 18th September, 1968 and has an annual capacity of about 40,000 tons. The two new electric pig iron furnaces of 24,000 kva each at MISL will have a total annual output of 1,20,000 tons when they go into production by about 1970-71. National policy should give sufficient priority and protection to electric pig iron capacity in meeting the demand for pig iron in the country. The position regarding demand and supply of pig iron should be carefully reviewed from time to time to ensure that electric pig iron furnaces do not run into unnecessary difficulties. The power rate should be sufficiently low and there should be no excise duty on electric pig iron.

Ferro-alloys.

3.11. Regarding ferro-alloys, the NCAER study states that "In overall terms the planned capacities for ferro-alloys are adequate to meet the demand even in 1975-76". However, MISL is going ahead with its expansion of ferro-silicon production.

The Steering Group Report of the Ministry of Steel states with regard to ferro-silicon that "Against the installed capacity of 30,000 tons in the country, the demand estimates are about 12,350 tons in 1973-74 and 18,000 tons in 1978-79. The only outlet for the extra production from this industry, as in the case of ferro-manganese, would be exports. And in this case also, assistance by way of cash subsidy, etc., would be necessary to achieve a step up in exports. In

the case of ferro alloys, which is another electro-metallurgical industry, the costs of indigenous production are very high. Even for the ferro alloys which have necessarily to be imported as they are not available within the country, the import duty is on the high side. If import substitution efforts have to succeed, it would be necessary to narrow the gap between the indigenous and import prices of alloy steels. Fiscal and other policies would, therefore, need to be aligned to achieve the above purpose. It would be desirable to give exemption from excise duty on ingots produced in the electric furnaces and it is essential to reduce import duty on ferro alloys where the supplies are not available indigenously or are very inadequate. The Steering Group would also recommend that the electro-metallurgical industries should be treated on a special footing with regard to electricity tariffs."

In the light of these recommendations of the Steering Group MISL should carefully evaluate the economics and profitability of its proposed new ferro-silicon units on the basis of a detailed project report containing realistic cost and price projections. Government of India should also be moved to review and realign its fiscal and other policies in this regard as suggested by the Steering Group, especially because any new ferro-silicon production will have to be export-based. The cost of electricity should also be kept to the minimum as this is a power intensive electro-metallurgical industry.

Specialization in production and use of steel.

3.12. Generally the growth of engineering and other industries in the country has resulted in greater specialization in the use of steel. This trend towards quality consciousness in the use of steel will obviously continue and intensify as Indian industry becomes increasingly specialized. This necessitates diversification of products with a view to cater to the requirements of a progressively discriminating home market and for competitive exports. Diversification pertains to both the quality of steel and the profiles manufactured. In view of the planned capacities for different types of steel in the various public sector steel plants, the problem of diversification needs to be looked into more carefully. Some imbalances between demand

and supply have arisen because the anticipated demand has fallen short of the planned supply in certain categories. For instance at Bhilai, the rail and structural mill has been designed to produce half million tons of rails on the basis of demand estimates made at the time of installing the plant. But at present the demand for rails is only about 2 lakh tons of which 1.25 lakh tons is being supplied from HSL and the balance from TISCO. 1.25 lakh tons is only 25% of Bhilai's capacity for the production of rails. Obviously there is a limit to which the products of the rail and structural mill at Bhilai can be diversified to meet other types of demand. Switching over capacities for exports is also not very simple. For instance the rail and structural mill at Bhilai is designed to produce 13 metre rails whereas the export demand is for rails of 18 to 20 metres. Moreover the export price results in a loss and there is a limit to subsidies. The price in the export market is not always based on the real costs of production of steel. The export prices are often subsidized by the profits in the home market. Sometimes the imbalances between demand and supply arise because the planned supply is inadequate to meet the existing demand as in the case of flat products. This can be met only by increasing the production capacities of the products in short supply.

The need to save foreign exchange by import substitution also results in a type of diversification which may not be ideal from the long term point of view. For instance, with regard to the Bhilai Steel Plant, it is officially stated that "Although the plant was not originally intended to manufacture special steel, a number of them are being produced successfully. Bulk of these special steels were being imported previously. Notable amongst them are electrode core wire quality rimming steel, shell bar steel, high tensile weldable quality steel, steel for wire rope industry, spring steel, gear cutting steel, etc. The production of special steel is steadily rising as follows:

Year	*Production (Tons)*
1964-65 ..	32,200
1965-66 ..	86,200
1966-67 ...	100,200 "

However, other major producers of steel are also producing some special steels though they have all been planned and designed for bulk production of only certain categories of steel.

It is an important policy matter to consider to what extent these big plants should continue to produce special steels when the alloy steel plant at Durgapur and MISL, Bhadravati, are specially intended to produce alloy and special steels. Obviously the big steel plants should produce such special steels only to the extent the alloy and special steel plants are not able to produce and fully meet the requirements in the country. To make the best use of available capacities in different steel mills, it should be a matter of general policy that production of special steels in big steel plants does not in any way affect the profitable production and sale of special steels by small plants such as MISL.

There should be some forum at which all the public sector steel plants including the alloy steel plant at Durgapur and MISL can discuss and decide regarding the products each plant is best suited to produce and how they could share the demand in the home market and abroad without unnecessary duplication and uneconomic production. The objective should be to make the best use of available capacities and plan the creation of future capacities in a manner which fully takes into account the natural advantages and capacities at different plants. It is well known that certain types of steel, especially alloy and special steels which are required in relatively small quantities compared to mild steel are best produced in small units.

The Steering Group has stated that for various reasons such as delay in commissioning of the finishing facilities, etc., it may take some time for producers using electric furnaces to produce special steels in larger quantities than estimated in the Report. This was however considered to be a temporary phase and it was recognized in the Report that adjustment should take

place in the early years of the Fourth Plan. It is therefore urgent that producers of alloy and special steels using electric furnaces are given every possible help to instal finishing facilities and balancing equipment in order to fully utilise their existing capacity and also to step it up to the extent necessary.

Exports. 3.13. Regarding exports, HSL has stated as follows : "During the year 1963-64, 15,396 tons of finished steel including 12,388 tons of rails were exported. Corresponding figures for 1964-65 showed a further rise when over 53,000 tons of finished steel were exported including 9,000 tons of rails. During the year 1966-67 export performance reached a new high when HSL earned Rs. 93.3 millions in foreign exchange through exports of 2,68,500 tons of iron and steel materials including 10,925 tons of rails, 3,458 tons of pipes and 10,455 tons of sheet in coils. The momentum was kept up in 1967-68 also, when during the first ten months of the year, HSL's export earnings reached the figure of over Rs. 240 million. It is expected that by the end of March 1968 export earnings of HSL will be over Rs 320 million, *i.e.*, over 300 per cent of the previous year's performance....Many of the products exported are highly sophisticated rails rolled to international specifications, ERW pipes made to API specifications, the most stringent in the world, and hot rolled sheets in coils which until recently were being imported by India." The increasing scope for exports will help in fuller utilisation of internal steel production capacities in different steel mills.

The export earning through direct export amounted to Rs. 53 crores in 1967-68 and is expected to increase to Rs. 65.70 crores during 1968-69. The yearly expenditure of foreign exchange on import of steel, import of material and components for the steel industry and on servicing the foreign debts and/or foreign exchange for new facilities is of the order of Rs. 175 to Rs. 200 crores, according to the Report of the Steering Group on Iron and Steel.

The foreign exchange earned by MISL exports during 1964-65, 1965-66, 1966-67 and 1967-68 were Rs. 45 lakhs, Rs. 53 lakhs, Rs. 50 lakhs and Rs. 96 lakhs respectively. Ferro-silicon is a traditional item

of export. However some other products were also exported though not profitably during the last two years. The quantities or tonnages of ferro-silicon exported were about 4,800 tons in 1964-65, 5,500 tons in 1965-66, about 2,400 tons in 1966-67 and 2,500 tons in 1967-68. The installed capacity of the ferro-silicon plant at MISL is 20,000 tons and production was 19,219 tons in 1967-68. The f.o.b. price realised during 1967-68 was about Rs. 1,200 per ton. The internal home market price was Rs. 1,293 ex-Works. The proposed additional ferro-silicon capacity at MISL is 15,000 tons. The cost of this proposed production is bound to be higher than that of the old units. Care will have to be taken to ensure that this production is exported at a remunerative price.

Charts and diagrams.

3.14. Diagrammatic representation of some salient facts and figures with regard to the steel industry including MISL are given in the following charts which are appended to the Report:

1. All India production of pig iron—1967-68.

2. All India production of saleable steel—1967-68.

3. MISL—Production and despatches of pig iron.

4. All India imports, exports and consumption of saleable steel.

5. MISL—sales by products—1967-68.

6. MISL—sales income—productwise—1967-68.

7. MISL—Number employed and payments and provisions.

8. MISL—Income and Expenditure—1967-68.

CHAPTER IV

Alloy and Special Steels, Ferro-Alloys and Pig Iron.

Alloy & special steels–definition.

4.1. Alloy and special steels will be increasingly required to meet the demand of engineering industries. They are required by the Defence Services and many industries such as machine tools, chemical engineering, aviation, automobiles, etc. The main raw materials required for making alloy steels are pedigree steel scrap, ferro-alloys, refractories, fluxes, graphite electrode and heavy electrical energy. Alloy steels can be broadly described as those steels into which elements other than iron, carbon or manganese are deliberately introduced beyond 1.2 per cent in order to give the steel certain special qualities. This definition does not cover special steels where it is not so much a question of introducing alloy elements but of controlling the common elements found in ordinary carbon steels. This is broadly the definition of alloy and special steels adopted by the National Council of Applied Economic Research in estimating the demand for these steels. The Indian Standards Institute (ISI) has evolved six different standards for alloy and special steels as follows:—

(i) *Alloy Steels.*

- (*a*) High carbon, high speed alloy tool and die steels.
- (*b*) Spring steels.
- (*c*) Alloy constructional steels.
- (*d*) Stainless and heat-resisting steels.

(ii) *Special Steels.*

- (*e*) Free cutting and low alloy steels.
- (*f*) Electrical steel sheets (silicon steels).

The first four items may be termed as alloy steels because alloying elements which are not commonly found in carbon steels such as nickel, chromium and molybdenum are deliberately introduced and their

proportion satisfied. The other two items coming under special steels contain practically all the elements found in carbon steels. However, while in carbon steels only the ranges for carbon and manganese are normally specified, in special steels, the ranges for all the elements are specified and have to be within those limits. The NCAER study on long term projections for iron and steel states that " Because of this latter feature, the production of special steels, although possible in integrated steel plants and in conventional furnaces, has to be given special attention. This also makes it necessary to assess their demand separately ". Unlike alloy and special steels, the standard carbon steels which are used for plates, sections, bars, tubes, etc., are normally specified by tensile properties but without detailed chemical composition. The quality of standard carbon steels is controlled where necessary not by specifying the entire chemical composition but by stating the maximum percentage of phosphorus and sulphur. Indian standards for alloy and special steels and the percentage range for alloying elements are given in Table No. 5.

4.2. Regarding the application and uses of alloy and special steels the NCAER study states as follows : Application and uses.

(*a*) High carbon tool steels—for making cutting tools, coinage dies, precision tools, razor blades, taps and punches.

(*b*) Nickel steels—for constructional purposes, such as automobile and machine construction of all kinds.

(*c*) Chromium steels—for special purpose involving resistance to wear and abrasion such as roller bearings, crusher plates, balls and stamp shoes, rustless steel parts, such as pump rods and cutting, and also for decorative purpose.

(*d*) Silicon steels—for low hysterisis loss in electric transformers, motors, chokes, capacitors, etc., springs and for acid resistant parts.

(*e*) Manganese steels—for points, crossings, rails, crushers and dredger parts.

(*f*) Tungsten steels—for magnets and high speed cutting tools.

(*g*) Nickel-chrome steels—for highly stressed constructional parts, oil-hardening and case hardening gears, armour plates and projectiles.

(*h*) Austentic nickel-chromium steels—for corrosion and heat resistant parts.

(*i*) Chrome-vanadium steels—for springs, constructional work, hooks, forgings and superheated tubes.

(*j*) Molybdenum steels—for super-heated steam parts such as tubes, bolts, etc.

Demand estimates NCAER.

4.3. By the end-use method the demand for alloy and special steels by 1970-71 and 1975-76, has been estimated by the NCAER as follows:

Alloy steels	1970-71	1975-76
	(Tons)	
Spring steels, silico manganese type only ..	63,970	92,090
Spring steel containing vanadium and other alloying elements.	5,310	7,850
Alloy constructional steel	125,490	189,190
High speed steel	4,680	7,000
High carbon alloy tool and die steel	15,650	23,990
Die blocks	670	920
Stainless and heat resisting steel	13,840	20,530
Sub-Total ..	229,610	341,570
Special steels—		
High carbon steels, other than carbon tool steel ..	41,300	76,170
Carbon and manganese free cutting steel ..	39,550	55,810
Electrical steel sheets	69,830	96,970
Sub-Total ..	150,680	228,950
Grand Total ..	380,290	570,520

Alloy steels constitute nearly 60 per cent of the total quantity included under alloy and special steels. Among the alloy steels, the larger tonnages are for (*a*) alloy constructional steels, (*b*) spring steels, silico manganese and (*c*) high carbon alloy tool and die steels and (*d*) stainless and heat resisting steel.

In the estimated quantity of special steels, electrical steel sheets account for nearly 45 per cent out of a total of about 150,700 tons. This is followed by high carbon steel and free cutting steel. As regards the shapes in which the alloy steels are required, all steels except stainless steel are required in the form of sections. The sections constitute nearly 72 to 75% of the total demand. For stainless steel, practically the entire requirement is in the form of sheets and plates.

The requirement of alloys and special steels from different groups of metal processing industries for 1970-71 has been estimated by the NCAER as follows :

	Alloy steels	*Special steels*	*Total*	*Percentage*
Metal products ..	66,960	43,370	110,330	30
Machinery, other than electrical	58,680	8,760	67,440	18
Electrical machinery ..	7,160	7,600	78,210	21
Transport equipment ..	93,180	20,560	113,740	31
Total ..	221,430	148,290	369,720	100

Thus, it will be seen that transport equipment manufacture accounts for the largest share of alloy steels (nearly 42 per cent), followed by metal products (30.5 per cent) and machinery manufacture (26.0 per cent).

Among the steel processing industries, the following are the more important consumers of alloy steels :—

	(*Estimates for* 1970-71) (Tons)
A. Metal products :—	
1. Auto leaf springs ..	35,000
2. Utensils	3,150
3. Small tools	19,000

	(*Estimates for* 1970-71) (Tons)
B. Machinery other than electrical.—	
4. Power and industrial boilers ..	13,400
5. Ball and roller bearings ..	24,020
6. Agricultural tractors ..	4,050
7. Crawler tractors, shovels, etc. ..	4,600
C. Transport Equipment.—	
8. Railway wagons	11,400
9. Automobiles, cars and trucks ..	50,410
10. Automobile ancillaries	21,370
11. Diesel engine vehicles	9,840
Total ..	196,240

This is nearly 89 per cent of the total demand for alloy steels.

Demand estimates—Steering Group.

4.4. The Report of the Steering Group on Iron and Steel of the Ministry of Steel and Heavy Engineering, Government of India (February 1969), estimates the demand for alloy and special steels for the 4th and 5th Plan periods, as follows:

Demand estimates for alloy and special steels.

	1969-70	1973-74	1978-79
Alloy steels.—			
High speed steel	2,400	4,700	7,000
Die blocks ..	300	675	920
Stainless and heat resisting	9,600	21,000	30,000
Tool steel	8,000	15,300	21,000
Alloy constructional	32,000	1,17,300	1,78,700
Spring steel	64,000	82,200	1,19,200
Total ..	1,16,300	2,41,175	3,56,820
Special Steels.—			
Carbon construction	32,000	25,000	39,000
Free cutting	12,000	25,000	30,000
	44,000	50,000	69,000
Grand Total ..	1 60,300	2,91,175	4,25,820
Add 1 per cent for incremental stocks	1,600	2,912	4,258
	1,61,900	2,94,087	4,30,078
say ..	1,62,000	2,94,000	4,30,000 tons.

It would be seen that the estimated demand for 1969-70 is 1,62,000 tons of alloy and special steels, of which only 44,000 tons is special steels, *i.e.*, 27 per cent of the total demand for alloy and special steels. The percentage of alloy and special steels to total steel produced, even in industrialised countries, does not exceed 7 to 8 per cent. Usually it is less. This is only an overall relationship which may not be applicable to the same extent in developing countries, especially in estimating demand for different types and categories required for industrial and other uses. In 1967-68, the total production of saleable steel in the country was 4.6 million tons (ingot steel 6.2 million tons). The demand for alloy and special steels for 1969-70 is 1,62,000 tons as estimated by the Steering Group which works out to about 3.5 per cent of the production of finished steel in 1967-68. The percentage will be less on the basis of the production of finished steel in 1969-70. The demand for alloy and special steels for 1970-71 as estimated by NCAER is 380,290 tons which works out to a percentage of 5.3 on an estimated demand of 7.125 million tons of finished steel in 1970-71.

The NCAER estimated the demand for alloy and special steels in 1975-76 at 570,520 tons which works out to 5.4 per cent on an estimated demand for finished steel of 10.5 million tons in 1975-76. The demand estimated for alloy and special steels by the Steering Group, *viz.*, 162,000 tons in 1969-70, 294,000 tons in 1973-74 and 430,000 tons in 1978-79 may therefore be considered to be conservative estimates, as the percentages to corresponding estimates of demand for steel work out to 3.5, 4 and 3.8 respectively. However, even on the basis of these demand figures, the Steering Group has estimated a gap or shortfall in supply of about 65,000 tons of alloy and special steels in 1973-74 amounting to about 22 per cent of the total estimated demand and shortfall of about 200,000 tons in 1978-79. It may be noted that the largest shortfall is expected to arise in the category of low alloy constructional steel, the demand for which is estimated at 117,300 tons in 1973-74 and 178,700 tons in 1978-79. It is observed in the report of the Steering Group that integrated steel plants are keen to diversify and produce low alloy

constructional steels. This aspect should be very carefully examined and integrated steel plants should not be encouraged to produce low alloy constructional steel unless the existing alloy and special steel units in the country are not able to meet this demand. There is no reason why the alloy and special steel units cannot do so as they should normally have a natural advantage and better control over quality and greater efficiency in the use of alloys. The Steering Group have stated that " the price disadvantage of steel made in electric furnaces may prove a serious handicap against the desired growth of demand for alloy steels. High prices of alloy steels may also give rise to substitution by cheaper mild steel or carbon constructional steel by the consuming industries. If such substitution takes place it is likely to affect the demand for alloy steels adversely. Quality consciousness and sales efforts may improve the trend; but the Sub-Committee has expressed the apprehension that this would continue to affect the demand for alloy steels. The Committee had also expressed the view that a good deal of pressure for imports is based on the ground of price rather than quality ". Therefore suitable policy decisions may be necessary to ensure a steady growth in the demand and production of alloy and special steels in the country.

It may be necessary to ensure that the electricity-based units get power at a reasonable rate and excise duty is not charged on their production. The Steering Group has pointedly observed that " the cost of electric power is about 8 to 10 paise per unit on an average as against the cost of electricity of 2.5 to 3 paise in other countries ". MISL has the benefit of relatively lower electricity rates and capital costs which should give it an edge over the Durgapur Alloy Steel Plant, especially if adequate steps are taken to install the necessary finishing and balancing equipment.

Production and finishing capacities.

4.5. The Steering Group has worked out the estimated shortfall of 65,000 tons of alloy and special steels in 1973-74 after taking into account the following capacities which are either installed or under implementation.

		Tons
Alloy Steel Plant, Durgapur	..	60,000
MISL, Bhadravati	..	77,000
GKW, Calcutta	..	42,000
Mahindra Ugines and Co.	..	36,000
Globe Industries	..	6,000
Canara Works	..	9,600
Total	..	2,30,600

On the basis of 90 per cent utilisation factor, the actual availability by 1973-74 will be 2,07,500 tons. Matching of the estimated shortfall has been considered under three distinct heads :

(i) Steel making capacity.
(ii) Cogging or primary rolling capacity.
(iii) Finishing capacity.

As regards stainless steel, the cold rolling facilities at Alloy Steel Plant, Durgapur, are substantially inadequate to achieve the rated production of about 14,000 tons. The sheet bar and billet mill installed at the Alloy Steel Plant, Durgapur, has a capacity of 3,00,000 tons against ingot making capacity of 1,00,000 tons. There is in-built extra capacity of 2,00,000 tons. It is suggested by the Steering Group that the ingot capacity at Alloy Steel Plant, Durgapur, be stepped up by 2,00,000 tons by 1977-78 by installation of additional electric furnaces. Even after taking into account the addition of 2,00,000 tons of ingots at Alloy Steel Plant, Durgapur, by 1977-78 it would still leave a gap of 1,15,000 tons of steel ingots or about 70,000 tons of finished steel according to the report of the Steering Group. In other words, even on the basis of the conservative demand estimates made by the Steering Group and assuming full utilisation of the Durgapur Alloy Steel Plant's rolling capacity, there is still scope for other units in the field to contribute to increase in capacities.

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MISL, Bhadravati, should make a determined effort to ensure that it does not lag behind, by quickly and fully utilising its present licensed capacity and also improving upon it, particularly with regard to quality. On the basis of the present licensed capacities, MISL is the biggest alloy and special steel unit in the country. Even from the point of view of the regional distribution of the industry, it is important to ensure that MISL fully retains its natural importance in the total alloy and special steel production in the country.

Investment needs.

4.6. The Steering Group's Sub-Committee for alloy and special steels and ferro alloys was set the task of assessing the demand for these items and formulating proposals for further development and investments. A representative of the MISL, Bhadravati, was a member of this important Sub-Committee and Shri H. Bhaya, General Manager of the Alloy Steel Plant, Durgapur, was its convener. The Steering Group in the Chapter on alloy steels, special steels and ferro alloys, has suggested that investments during the Fourth Plan may be of the following order:—

	Total :	*Of which foreign exchange.*
	(Rupees in crores).	
Public Sector.—		
ASP Durgapur spill over ..	12.25	N.A.
Phased expansion of ASP. ..	20.00	5.00
Centrally Assisted Project.—		
Mysore Iron and Steel Ltd. ..	4.60	N.A.
Other Units.—		
Spill over of private sector projects including investment on new units (including Bihar Alloys and High quality steel).	40.00	15.00
Total ..	76.85	20.00

It is obvious that the investment of Rs. 4.6 crores at MISL, Bhadravati, would be grossly inadequate to meet even its minimum needs. An investment of a much higher order will be necessary at Bhadravati if MISL is to be enabled to contribute its rightful share to the total alloy and special steel production in the country. Immediate steps should be taken to inform

and impress upon the Planning Commission and the Union Steel Ministry, of MISL's investment requirements during the Fourth Plan period. At least the Steering Group should have been fully and properly appraised of MISL's real capital requirements for its legitimate improvement and development plans. The Estimates Committee during its discussion with the Planning Commission clearly indicated to them that MISL's investment requirements during the next Five Year Plan should be fully taken into account.

Licensed capacities.

4.7. The present licensed capacity of MISL is 77,000 tons of alloy and special steels, the break-up of which has already been given in para 2.8 of Chapter-II. In the light of the detailed demand surveys made by NCAER and Steering Group on Iron and Steel, MISL and Mysore Government should take immediate steps to re-assess its present licensed capacity and see in what way it could be improved to bring it fully in line with its present and future requirements. MISL should make adequate arrangements for continuous market research to take full advantage of the wide range of alloy and special steels of varying specifications, size and finish that would be required by a fast developing market.

To complete the picture regarding estimates for alloy and special steel and the licensed capacity, reference may be made to the discussions the Estimates Committee had with Shri M. B. Rao, Adviser, Planning Commission, on 3rd July 1969. It was stated that the demand for alloy and special steels in 1965 was about 115,000 tons though the licensed capacity was more than double this figure. Apart from the total licensed capacity of 2,30,600 tons, it was stated that proposals for further licensing of capacity were as follows :—

Bihar Alloy & Steel	40,000 tons.
High quality steel, West Bengal	19,000 tons.
Alloy Steel Industrial Factory, Salem.	37,000 tons.
Madras Alloy & Stainless Steel	14,000 tons.
J.K. Iron & Steel	16,800 tons.
	1,26,800 tons.

This would increase the licensed capacity from 2,30,000 to 3,50,000 tons, as against the demand of less than 3,00,000 tons at the end of 1973-74 estimated by the Steering Group. It may be recalled that the 4th Plan formulated in 1965 had put the demand for alloy steels at 4,00,000 tons by 1970-71. However in the revised draft 4th Plan prepared in 1968, the demand for alloy steel was put at 2,84,000 tons at the end of 1973-74. Against the licensed capacity of MISL of 77,000 tons, production during 1969-70 is expected to be of the order of 45,000 tons. The Estimates Committee was informed that MISL has not so far come up with any specific proposals for further expansion of its capacity of 77,000 tons. The State Government had not come up before the Working Group of the Planning Commission for any expansion during the 4th Plan. However, in April 1969, a mention was made about the expansion of MISL in an enclosure to the Chief Minister's letter. This matter regarding the expansion of MISL and adequate finances for the purpose needs to be pursued more specifically because, in the ultimate analysis, what will count is not so much licensed capacity as actual production. Those who are earlier in the field will naturally benefit.

Stainless steel.

4.8 There is an increasing demand for stainless steel in the country for making utensils, furniture, chemical bearing metals, pumpsets, etc. The demand for making utensils and other uses are likely to increase if the present supply constraints are removed. The production of stainless steel is also attractive from the point of view of profitability. The cold rolling facilities at Alloy Steel Plant, Durgapur, are substantially inadequate to achieve the rated production of about 14,000 tons. In this connection the Steering Group has mentioned the possibility of installing continuous Sendzimir mills to produce sheets in coil form. The Steering Group states that "The demand for cold rolled thinner guage stainless steel sheets is already very attractive and has got scope for further expansion. There is a clear shortage of about 3,000 tons in 1969-70 going up to about 7,600 tons in 1973-74 and 11,000 tons in 1978-79. The economics of rectifying the present imbalances of the Alloy Steel Plant at Durgapur sheet mill have to be carefully gone into since the world-wide

trend now is to produce such sheets in coil form in continuous mills incorporating continuous hot rolling, annealing, picking, cold rolling and finishing. The minimum economic size, however, is understood to be of the order of 1,50,000 tonnes per annum. A mill of this type would involve large investments and may be somewhat ambitious at this stage". The Sub-Committee on alloy and special steels has however stated that "even with 30 to 40 per cent utilisation of capacity such a mill can be remunerative. The economic feasibility of setting up such facilities would have to be a subject for detailed study in relation to the further expansion of alloy steel plant". It may be recalled that the NCAER had estimated the demand for stainless steel and heat resisting steels at about 11,000 tons in 1970-71 and 16,000 tons in 1975-76. In view of the fact that the demand for stainless steel is likely to increase more rapidly than what has been estimated by the NCAER and the Steering Group of the Ministry of Steel, steps should be taken to examine the economic feasibility of producing stainless steel in such quantities as are suited to internal demand. MISL should also give detailed thought to this matter as stainless steel is included as a part of its industrial licence.

Ferro-alloys

4.9. The Steering Group of the Ministry of Steel, Government of India, has estimated the demand for ferro-alloys based on steel production targets of the integrated steel plants and of alloy steel by electric furnace units as follows:

	(In tons)	
	1973-74	1978-79
Ferro manganese (high carbon).—		
(a) For tonnage steel plants	111,699	163,107
(b) For alloy steel units	4,592	6,884
	116,291	169,991
say ..	116,300	170,000
Ferro Silicon.—		
(a) For tonnage steel plants	5,895	8,716
(b) For alloy steel plants	6,456	9,344
	12,351	18,060

(In tons)

	1973-74	1978-79
Low carbon ferro manganese	2,485	3,085
Low carbon ferro chrome	2,897	4,316
Ferro vanadium	910	1,370
Ferro molybdenum	1,346	1,999
Nickel	5,578	8,273
Ferro tungsten	896	1,272
High carbon ferro chrome	10,848	16,942
Ferro titanium	34	49
Ferro silicon zirconium	60	75
Ferro chromium silicon	1,200	1,664

Pig iron.

4.10. The NCAER in its recent study on the long term projections for Iron and Steel has also estimated the demand for pig iron for foundries. Pig iron needed for production of iron castings in foundries is referred to as pig iron for sale to distinguish it from basic pig iron which is consumed within the steel plant itself for the production of ingot steel. The demand for foundry grade pig iron will naturally depend on the volume of iron castings and on the quality and availability of cast iron scrap which is also used in substantial quantities along with fresh pig iron in cupolas for the production of iron castings. The demand for grey iron castings constitutes about 95 per cent of demand for iron castings, malleable iron castings and ductile/alloy castings are the other types of iron castings and these require pig iron with special properties. Pig iron produced in electric furnaces are superior in quality to blast furnace pig iron because, in an electric furnace, coke is largely replaced by electricity, thereby reducing the impurities that go into the metal when coke is used. The producers of castings who are quality conscious would prefer electric pig iron to blast furnace pig iron especially for specialised castings.

The aggregate demand of all economical sectors, for iron castings has been classified by the NCAER as follows :

Broad Sectors/Users	1970–71	1975–76
	(Tons)	
Railways	4,65,260	5,86,650
Steel plants	3,48,920	4,33,560
Water supply and sewage schemes	3,31,000	4,60,000
Steel processing industries in the organised sector	4,07,120	5,86,180
Sewage and drainage pipes	2,00,000	2,70,000
Non-industrial castings	6,80,000	9,00,000
Small units	44,000	62,000
Maintenance requirements	2,14,000	2,88,000
Total ..	26,90,300	35,86,390

After assessing the total demand for all iron castings, the availability of cast iron scrap, the current practice and the future trend in the use of cast iron scrap in foundries are taken into account in arriving at the net requirement of foundry grade pig iron. The present overall ratio of pig iron to castings is 0.65 to 1.0. Applying this ratio the requirement of foundry grade pig iron is estimated at 1.75 million tons in 1970-71 and 2.33 million tons in 1975-76. It is possible that with the availability of more return scrap, this ratio can get reduced in the future.

Special grades of pig iron are required for (*a*) ductile and alloy castings (*b*) malleable castings and (*c*) cast iron spun pipes, all of which constitute a very small percentage of the total castings. All the other iron castings can be produced with the foundry grade pig iron that is available from the large blast furnaces at relatively lower cost. The requirement of special grade

pig iron for special castings has been estimated as follows :

	Total requirement of castings	*Requirement of pig iron*	*Specifications of pig iron*
	Tons	Tons	
Malleable and ductile iron castings in 1970-71.	33,440	10,000	IS 2841, Low phosphorous Si 1.25-2.250 Mn.0.35-1 S. 15 max. P. .02-.05 IS 244 Grade III with P.O. 06-0.9 Si1.75-2.25 Mn. 5-1 S. .0 Max.
Malleable and ductile iron castings in 1975-76.	47,190	14,000	IS 2481 as above.
Spun pipes in 1975-76 ..	3,00,000	225,000	IS Grade III as above.

From this brief analysis, it will be seen that long term policy decisions should be taken to protect and encourage the production of electric pig iron so as to increase its proportion in the total pig iron supplied to foundries in the country. The relative economics will largely depend on the rate of electricity and the higher price that foundries may be prepared to pay for better quality pig iron for production of better quality castings. This will depend also on the quality consciousness of both the producers and users of castings. There is every likelihood of foundries preferring blast furnace pig iron to electric pig iron on grounds of lower price, irrespective of quality. Here also there is a strong case for the abolition of excise duties on electric pig iron and the provision of other long term policy protection to this industry which is crucial to the quality of castings and therefore to the whole range of engineering industries.

In short a policy distinction should be made between blast furnace pig iron and electric pig iron which at present constitutes a very small percentage of total production. Mysore Government should pursue this matter with the Government of India as MISL, Bhadravati, is one of the earliest producers of electric pig iron and at present the biggest producer of electric

pig iron in the country. With the commissioning of their two new 24,000 kva electric reduction furnaces, MISL will have quite a lot of electric pig iron for sale and it is necessary to ensure that they are able to do so profitably under all conditions. In the case of the integrated steel plants and the large blast furnaces, the bulk of the pig iron is produced for steel making in the plant itself and only the residual quantities are sold to foundries or exported. It is significant to note that the export price at present is such that it is not possible to profitably export pig iron produced from electric furnaces. In the large steel plants it does not matter to the same extent for reasons already stated. Moreover the unit cost of pig iron produced on a large scale is bound to be considerably lower than the electric pig iron which is produced on a relatively small scale in electric furnaces whose production is 100 to 200 tons a day, compared to 1,000 to 1,500 tons a day of the large blast furnaces. That is why a policy distinction should be made between these two types of pig iron in order to ensure that fluctuations in the total supply and price of pig iron from large blast furnaces do not upset the economics of electric pig iron furnaces.

Electricity is a crucial input and the economics of electric pig iron will largely depend on the rate of power. As a matter of fact whatever the Steering Group has said regarding the need for cheap electricity and abolition of excise duty for electricity-based steel production applies more strongly to electric pig iron production which at present is marginal from the point of view of production and profitability. It may be necessary to reserve certain categories of pig iron for production from electric furnaces which belong to the small scale sector in the iron and steel industry. It is significant to note that under the present circumstances electric pig iron furnaces are not being installed on the anticipated scale. As a matter of fact out of 27 licences issued for setting up pig iron units, only one or two have materialised and that too in Mysore State because of the relatively lower rate of electricity. This is a clear indication that major policy decisions will have to be taken if the electricity-based pig iron and steel industry is to be encouraged and stabilised in the country.

Steel forgings.

4.11. As stated by the NCAER " Steel forgings are important intermediate products in the engineering industry. They are finding increasing applications in machine building activities and in the manufacture of transport equipment. If produced in adequate quantities, the cost of forged parts can be competitive with components made of cast steel or parts fabricated by welding. Steel forgings possess ample qualities to resist external forces and because of this, the use of parts of lighter sectional thickness is permitted, thus considerably reducing the weight of reciprocating or rotating parts of machinery."

The MISL is also contemplating the establishment of a forging unit and it is therefore pertinent to briefly look at the demand estimated for steel forgings. By the end-use method the NCAER has estimated the demand for forgings as follows :—

Industry sub-groups	*Demand (Tons)*	
	1970-71	1975-76
Metal and metal products	6,100	9,140
Machinery, other than electrical	60,236	87,328
Electrical machinery	6,250	8,570
Transport equipment	92,873	129,374
Miscellaneous	8,372	11,721
Total	173,831	246,133
Total (in round figures) ..	173,830	246,130

It amounts to 173,830 tons for 1970-71 and 246,130 tons for 1975-76. Transport equipment is the most important consumer of forgings and within this group demand for commercial vehicles and ancillaries is the largest, being nearly 24,000 tons and 21,000 tons respectively for 1970-71 accounting for nearly 60 per cent of this group. In the machinery group which comes next in total demand, the more important items from the point of view of large tonnages are diesel engines, metallurgical and other heavy equipment. The demand for forgings below 230 kgs. constitutes the bulk, being about 70 per cent of the total.

4.12. In the recent study made by the NCAER, the demand for steel castings has been estimated at 1,42,000 tons and 2,11,000 tons by 1970-71 and 1975-76 respectively. The aggregate demand for steel castings is expected to increase by 43 per cent between 1965-66 and 1970-71 and 48 per cent between 1970-71 and 1975-76. The break-up of aggregate demand for carbon steel and alloy steel is as follows :— Steel castings.

(Tons)

	1970-71	1975-76
Carbon steel	1,21,360	1,77,150
Alloy steel	20,640	33,890
Total ..	1,42,000	2,11,040

A further break-up of the aggregate demand by broad user groups is given below :—

Sectors	1970-71		1975-76	
	Manufacturing	*Maintenance*	*Manufacturing*	*Maintenance*
Industries ..	44,360	44,300	67,470	66,080
Transport ..	39,020	3,870	55,010	4,500
Power and other sectors ..	9,450	1,000	15,980	2,000
Total ..	92,830	49,170	138,460	72,580

It will be seen from these figures that the maintenance requirement forms about 34 per cent of the total demand for steel castings. The largest share of the maintenance requirement is accounted for by steel plants and for replacement parts in vehicles.

CHAPTER V

Steel Prices and Costs

Broad objective.

5.1. The working of steel plants should be judged not only by the quantum of production but also by the costs and value of steel produced and sold, on which depends profitability and the capacity of the industry to grow and expand on its own strength. In a controlled economy, offtake at a remunerative price on a planned cost-plus basis is assured and the productive units are expected to concentrate mainly on physical production and the achievement of rated capacities. In a country like India where we have a mixed economy, and economic production and distribution is not completely controlled, those who are responsible for policy making and implementation have to seriously consider whether their pricing policies enable production units to cover costs of production and generate sufficient earnings or profits to undertake such rate of growth and modernization as is absolutely necessary to maintain the health of the industry and its competitive strength, in order to cater not only to the expanding home market but also to export. The trend of costs and prices of the steel industry in India should be critically viewed in the light of this broad objective in order to determine what major policy changes are necessary to ensure that a broad-based and diversified steel industry develops in our country.

Investment and sales.

5.2. At present the total capital employed in the public sector steel plants as per their Balance Sheets for the year 1967-68 was Rs. 1,098 crores including Rs. 81 crores for works in progress. The total income from sales for 1967-68 was Rs. 257 crores; the ratio of capital employed to total sale value was 1:0.24. In the case of MISL capital employed at the end of 1967-68 was Rs. 40 crores including Rs. 22 crores for works in progress, as against total sale value for the year of Rs. 13 crores, giving a ratio of capital employed to sales of 1 : 0.32. In the case of TISCO capital employed and total sales for the year 1967-68 were Rs. 150 crores and Rs. 138 crores respectively giving a ratio of 1 : 0.92. The corresponding figures for

IISCO for the year 1967-68 were Rs. 101 crores capital employed and Rs. 73 crores income from sales which gives a ratio of 1 : 0.73. Normally, in the case of heavy industries the ratio of capital employed to total sales is expected to be of the order of 1 : 1. These figures indicate that there is considerable scope for the public sector plants to improve their sale proceeds by completing their expansion programmes and by fuller utilisation of existing capacity and by getting a price which meets more fully their cost of production.

Prices and cost of production.

5.3. The cost of producing steel in India has been increasing over the years, reducing the relative cost advantage enjoyed by our steel industry compared to the cost of production of foreign producers. The Government of India Committee on "Cost of production of steel" known as the Mahatab Committee went into this question in detail in their report published in the year 1966. The K. N. Raj Committee Report of Steel Control published in October 1963 indicated the increase in the steel prices of different categories of Indian steel as follows :—

	October 1939 (*F.O.R. Calcutta*)	*June* 1948 (*F.O.R. Main Ports*)	*June* 1959 (*F.O.R. Railheads*)	*September* 1963 (*F.O.R Railheads*)
Light bars ..	170	333	600	626
Heavy bars ..	158	316	590	616
Structurals ..	160	325	610	645
Plates ..	157	354	685	742
Sheets ..	190	387	630	813

It would be seen that the steel prices have increased approximately four times between 1939 and 1963 and by 90 to 100 per cent between 1948 and 1963.

The Mahatab Committee on the cost of production of steel pointed out that between 1949 and 1965 the selling prices of steel increased faster than the corresponding ex-works prices due to relatively steeper increases in excise duty, surcharge, etc. For instance, excise duty which was Rs. 5 for the different categories of steel in 1949 increased to Rs. 70 to Rs. 97 in 1964 and Rs. 125 to Rs. 175 from August 1965 onwards on different categories of steel. During

the period 1949 to 1965, ex-works prices alone increased from Rs. 230 to Rs. 492 for light bars, Rs. 221 to Rs. 522 for structurals, Rs. 281 to Rs. 659 for black sheets and Rs. 250 to Rs. 594 for plates, whereas the selling prices for these categories increased from Rs. 295 to Rs. 683 for light bars, Rs. 285 to Rs. 713 for structurals, Rs. 315 to Rs. 897 for black sheets and from Rs. 282 to Rs. 792 for plates. The freight, surcharge and cess was Rs. 63 to 66 from August 1955. Therefore for fair comparison, the Mahatab Committee compared Indian ex-works prices with ex-works prices in foreign countries. It pointed out that during the period 1953 to 1965 the gap between our ex-works prices and ex-works prices abroad has progressively narrowed. For light bars, for instance, our ex-works price in May 1953 was Rs. 299 per ton as compared to Rs. 405 in U.K., Rs. 417 in U.S.A., Rs. 432 in France and Rs. 440 in Germany. In November 1965 however our ex-works price for light bars was Rs. 537 per ton as compared to Rs. 539 per ton in U.K. and Rs. 622 per ton in U.S.A. For hot rolled sheets our ex-works prices in May 1953 and November 1965 were Rs. 365 and Rs. 704 respectively as compared to Rs. 501 and Rs. 770 in U.K. and Rs. 398 and Rs. 557 in U.S.A. for the corresponding periods. For thick plates our ex-works prices in May 1953 and November 1965 were Rs. 330 and Rs. 639 respectively as compared to Rs. 386 and Rs. 559 in U.K. and Rs. 412 and Rs. 583 in U.S.A. for the corresponding periods. The Mahatab Committee commenting on these figures stated "Since 1953 our prices have risen faster than the prices in these countries, even so our ex-works prices for bars and structurals are even currently competitive with the prices of these categories in these countries although marginally so". Our prices for hot rolled bars and sheets are less competitive.

Capital block and price increase.

5.4. The Committee also pointed out that our ex-works price is based on an unrealistically low capital block per ton of saleable steel capacity, *viz.*, Rs. 1,176 per ton. "The capital block for the three HSL plants (Stage I) is about Rs. 2,500 per ton of saleable steel capacity. At the end of Stage II of the expansion of these plants which would absorb the inbutli capacity

of Stage I, the capital block would be nearer Rs. 2,000 per ton of saleable steel".

On 1st May 1967 an increase of Rs. 48 per ton was allowed to the producers to meet the increased cost of production. The producers again represented that a further rise in the price should be allowed to meet the increased costs of raw materials, freight, wages, etc. After careful consideration a price increase of Rs. 46 per ton was allowed to producers with effect from 31st July 1968. The Ministry of Steel, Government of India, in its Report of 1968-69 states as follows:

"During the year, the Freight Equalisation Scheme, under which iron and steel produced by the main producers are saleable at a uniform price at all railheads throughout the country, was continued. Similarly, the scheme for supply of iron and steel at international prices to fabricators of engineering goods for export was also continued. The cost of financing both the above schemes is met from funds accruing to the JPC from the sale prices of iron and steel which include a special element for this purpose". Though statutory control over the production, prices and distribution of steel had been removed with effect from 1st May, 1967, the JPC continues to exercise non-statutory or informal control over the prices and distribution of steel in consultation with the Government.

Shri J. R. D. Tata, Chairman of the Tata Iron and Steel-Company Limited, in his statement to the Annual General Meeting for the year 1968-69 has made the following points:

(i) The Indian price of steel excluding excise duty in a representative product-mix is about Rs. 655 against Rs. 835 in U.K. Rs. 1,070 in U.S.A., Rs. 790 in Japan, Rs. 795 in West Germany and Rs. 785 in Australia.

(ii) As against increases in works cost since 1964 totalling to Rs. 130 per ton due to factors beyond the industry's control, Government have allowed price increases of only Rs. 88 up to August 1968.

(iii) The average capital cost of the Jamshedpur Plant per ton of steel is about Rs. 1,640, and is steadily rising as old equipment is replaced by new while the average of the three HSL Plants is in the neighbourhood of Rs. 2,500 per ton.

(iv) In regard to overheads, the Tariff Commission at its last enquiry into the affairs of the steel industry in 1962 had recommended that steel prices should include Rs. 172 per ton for depreciation and return on a notional standard gross block of Rs. 1,300 per capacity-tonne. Government however allowed a provision of Rs. 156 by reducing the standard block to Rs. 1,176.

(v) He, therefore, concludes that TISCO and IISCO are unable to pay dividends from current profits. (The Chairman of IISCO also states that " profit margins are insufficient for the creation of adequate taxed resources ").

Shri K. T. Chandy, Chairman of HSL, in his statement to the shareholders at the Annual General Meeting for the year 1967-68 has stated as follows :

" The worldover the steel industry with its heavy capital related charges relies on a very high level of capacity utilisation for breaking even. In the context of our pricing structure which presupposes 100 per cent employment of capacity besides being based on capital block out of line with capital cost of modern equipment, the price for even marginal underutilisation of capactiy is heavy. In this situation the cost to your company of the significant under-employment of capacity brought about to a large extent by factors beyond its control can be easily visualised ".

HSL losses and price increase

5.5. The total net loss made by the four public sector steel plants including Alloy Steel Plant, Durgapur, managed by HSL, was of the order of Rs. 40 crores in the year 1967-68. An attempt has been

made in Table No. 6 to roughly calculate the total costs and profitability of the HSL's plants on the basis of 60 per cent, 70 per cent, 80 per cent, 85 per cent 90 per cent and 100 per cent utilisation of capacity. The costs have been arranged under three broad categories, *viz.*, variable, semi-variable and non-variable for the sake of convenience and proper analysis. It would be seen from this Table that on the basis of 100 per cent utilisation of capacity, HSL plants would have made no loss though they would not have made any profit either. In other words, on the basis of the present JPC prices, the break-even point for the HSL plants is at 100 per cent utilisation of capacity. However, it is not realistic to assume 100 per cent utilisation of capacity. While it should be possible for these plants to reach 80 per cent capacity without much difficulty, any increase in percentage utilisation of capacity above that will be increasingly difficult and will depend on various factors and conditions including level of efficiency and maintenance services, and steady off-take of planned production at a reasonable price, etc. At 80 per cent utilisation of capacity, the HSL plants would have made a loss of about Rs. 29 crores instead of Rs. 40 crores. The present price formula is based on works cost plus Rs. 20 for other expenses plus five per cent depreciation and eight per cent return on capital on the notional capital block of Rs. 1,176 per ton, *i.e.*, Rs. 153. At 80 per cent rated capacity, the ingot production of HSL plants would have been 4.70 million tons and the finished steel production would be 3.9 million tons approximately on the basis of 83 per cent yield from ingot to finished steel. In order to earn Rs. 29 crores more on 3.9 million tons of steel, the break-even price per ton of steel would have had to be higher by Rs. 75 per ton. This is precisely what would have happened if the five per cent depreciation and eight per cent return on capital for the purpose of the JPC price formula was calculated on a notional capital block of Rs. 1,800 per ton instead of the present capital block of Rs. 1,176. On this basis the JPC price would have been works cost, plus Rs. 20, plus Rs. 228 which is 13 per cent on the capital block of Rs. 1,800. At 85 per cent utilisation of capacity, the HSL plants would have made a loss of Rs. 20

crores and the break-even price per ton of steel would have had to be higher by Rs. 50 per ton. In other words, the capital block would have had to be taken as Rs. 1,600 instead of Rs. 1,176. It has been stated that the capital block per ton for the HSL plants even after completion of the present expansion programme will be about Rs. 2,300 per ton. It is important to remember that the extent to which the above assumptions are correct and realistic, the steel plants are subsidising the consumers of steel. To the extent to which there is such a built-in loss or subsidy in the steel prices 'informally' controlled and regulated by the Joint Plant Committee, the management of the public sector steel plants are not to blame for the financial results or losses. As already pointed out, even if 80 per cent of capacity is utilised there would be still, a loss of Rs. 29 crores on the basis of the present prices which are fixed in consultation with the Government of India. To enable the general public and the country to have a proper idea of the relative efficiency or otherwise of the different steel plants especially those in the public sector, it is necessary that this position is made very clear to all concerned, in Parliament or elsewhere. At present, there is insufficient realisation of these factors and their cost, price and profit implications which results in an exaggerated and unrealistic view of the losses made by the public sector units. If the steel prices in the country are fixed in a realistic manner, the competitive position of MISL, Bhadravati would also improve to some extent, though what is really important for small iron and steel producing units like MISL based on electricity is that they are enabled to get a higher net return compared to the big steel plants in view of their relatively high cost nature. The policy of both Central Government and State Government should fully take this into account.

In reply to the question whether an increase in steel prices will place an excessive burden on users of steel, Shri J. R. D. Tata states that an increase of the order of Rs. 100 per ton in the cost of steel annually purchased by the Railways—the largest single consumer of steel in the country—would come to about 0.7 per cent of their annual expenditure. In the case of engineering products, the percentage of their selling

prices represented by the cost of steel naturally varies according to the steel content of each product. It ranges, for instance from about two per cent in a typewriter to 24 per cent in a railway wagon. Hence, an increase of Rs. 100 or so, equivalent to about 11 per cent of present selling prices of steel, inclusive of freight and excise duty, would represent only about 0.2 per cent to 2.5 per cent of their respective selling prices.

As regards Excise duty, it is pointed out that Government collected Rs. 70 crores in 1967-68 from the tax of which Rs. 23 crores was the Excise duty paid by TISCO and Rs. 32 crores by HSL. It is interesting to note that the total loss of HSL for the year 1967-68 was Rs. 40 crores. In other words, HSL would not have made a big loss if there was no Excise duty or if depreciation and return had been calculated on a more realistic capital block per ton, and not on a notional capital block of Rs. 1,176 which was based on TISCO's block in 1962.

The K. N. Raj Committee on "Steel Control" has also stated that "the present retention prices do not provide adequately for the replacement of plant at current or prospective replacement costs. It is our view that the gross block should not be under-estimated simply out of the fear that the general level of steel prices will have to be raised or that the valuation at replacement cost might enable the older plants in private ownership to accumulate larger surpluses. If they accumulate larger surpluses as a result of higher retention prices, but do not deploy them for modernization and expansion, other measures can be taken". The Raj Committee emphasizes that "the public sector plants could be placed in a position of great disadvantage if steel prices do not take into account current replacement costs". The Raj Committee however adds that "the fuller provision which needs to be made for plant replacement at current or prospective costs can, and should be done without a uniform upgrading of the prices of all categories of steel"....."The additional provision should be made as far as possible through adjustments in the relative price structure of steel which, as it stands, does not reflect true relative costs. There need not be, therefore, a sizeable increase

in the average price for steel allowed to producers but only increases in the prices of the scarcer categories and more difficult sections. A shift of this kind in the relative price structure is required in the prevailing circumstances". "The JPC should adjust from time to time according to demand conditions".

Retention prices

5.6. Under Indian conditions steel has an almost monopolistic position and constitutes a crucial input in all developmental projects. Therefore there is need to resolve the conflict between allowing a realistic price to the steel producers and ensuring that the price of steel does not become excessive for the users of steel as steel is of strategic significance to the cost of our industrial output. It may be recalled that there was a system of retention prices up to 1st March 1964. According to this system there was a selling price and a retention price for different categories of steel. The retention prices included works cost such as raw material operating charges and overheads and return which included head office expenses, selling expenses, depreciation on gross block, interest on capital and return on gross block. Additions to retention price, *viz.*, excise duty, railway freight and surcharge gave the selling price. Under this system the producers sold steel at the notified selling prices but retained only what they were eligible to. The difference between the retention price and selling price was credited to the Iron and Steel Equalisation Fund. The Fund was originally created to subsidise the higher cost of imported steel, but has also been used for other purposes like equalising freight from the steel works to the destination railhead since 1956. It was from the Equalisation Fund that Government made certain special advances to TISCO and IISCO in 1954-55 to enable them to undertake their expansion projects.

The Report of the Indian Tariff Board (1949) on the "Fair Retention Prices of Steel produced by the Mysore Iron and Steel Works, Bhadravati" justifying differential retention prices for Mysore Iron and Steel Works, Bhadravati has stated as follows:

"In paragraph 16 of our Report on the fair retention prices of steel produced by the Tata Company and

the Steel Corporation, we have recommended the fixation of differential retention prices because the costs of the two units differ owing to the fact that they are unequal in size, equipment, financial resources, and technical experience. We consider that, for these reasons and also in view of the unfavourable location of the Mysore Works, its smaller rated capacity and certain technical handicaps suffered by it which we have already pointed out, it is desirable to fix a separate ex-works retention price in respect of steel produced by it. While we recognise that the price of steel produced by the Mysore Works is much higher than that of the Tata Company or the Steel Corporation, we should like to point out that even this high price compares favourably with the price of imported steel. Moreover, when there is an overall shortage of steel, it is undoubtedly desirable that the production of indigenous steel should be encouraged even by paying a higher price for it, provided such a price is based on the cost of production. Such a course would involve no administrative difficulty, as there are only three well organised units in the industry. It is obvious that a uniform retention price cannot be fixed on the basis of the costs of production at the Mysore Works, since it would unduly inflate the profits of the other two companies and involve an unduly heavy burden on the consumer of steel. On the other hand, the fixation of a uniform retention price on the basis of the costs of the Tata Company or on the basis of the schedule of uniform prices recently announced by Government, would make it impossible for the Mysore Works to continue production. The only practicable and equitable method of price fixation in such circumstances is, therefore, to have a differential retention price for the Mysore Works on the basis recommended by us, while fixing a uniform sale or issue price for steel to consumers in all parts of India including the acceding States. Such a method of price fixation would be quite fair to each of the units concerned and at the same time entail the least possible burden on the consumers of steel".

Fair retention prices as estimated by the Board in respect of rods and bars were as follows:

		Rs. per ton
The Tata Iron and Steel Company	..	226
The Steel Corporation of Bengal	..	242
The Mysore Iron and Steel Works	..	331

Informal price control-JPC

5.7. In the history of price control over steel, 1st March 1964 represents a major turning point. On this day, prices and distribution controls were relaxed over a large number of categories of steel where the demand-supply equation was considered satisfactory. As at the end of March 1966 about 70 per cent of steel despatches from main producers were of decontrolled categories and the balance of controlled categories. A body called Joint Plant Committee was set up and placed in charge of distribution as well as the fixation of selling prices of the free categories. This body has as its Chairman, the Iron and Steel Controller and as its Members, a representative each of the five integrated steel plants and a representative of the Railways. The Joint Plant Committee operates a Freight Equalisation Fund to equalise outward freight so that steel could be sold at uniform prices at all railheads. For meeting its expenses, the Joint Plant Committee charges a cess of Re. 1 per ton of steel despatched. The Steel Equalisation Fund has been wound up with effect from 1st March, 1964. Since Equalisation Fund ceased to operate on 1st March, 1964, selling prices are composed of the ex-works price, equalised freight, JPC cess and excise duty which is on the product and differs from product to product.

The Steering Group on Iron and Steel of the Ministry of Steel in its report of February 1969 has stated that "the removal of informal price control on steel prices will considerably help in the adjustment of economic forces of supply and demand and integrated exports."

The Steering Group has stated further in this regard as follows:

> "In India despite decontrol of steel, an informal regulation of the internal prices continues. Firstly, it deflects from the normal adjustment of economic forces of supply and demand, the

efforts in economising on steel consumption are nullified. Secondly, it makes it impossible for the Indian exporters to cover losses incurred by them on exports through domestic prices. It is felt that instead of keeping an informal price control on the domestic prices of steel and providing cash assistance on export from market development fund and subsidies, etc., greater freedom should be given to the producers to fix prices for the domestic market. This could relieve the Government resources in this respect and also provide an instrument for curbing indigenous consumption to some extent where absolutely necessary."

Alloy steels

5.8. It is well known that demand for different types of high alloy steels is small and specialised. It would help a great deal if a certain amount of standardisation could be introduced in the demand for alloy and special steels.

There should be some sort of arrangement by which the total demand for alloy and special steels could be channelised through some common agency which could be in close touch with the producers of such steels. Sooner or later it may become necessary for the producers of alloy and special steels to come together on an informal basis and evolve prices for alloy and special steels in their mutual interest and with a view to effectively cater to the demand. The engineering industry at present needs a wide variety of steels, especially quality steels. In the manufacture of engineering products ordinary mild steel has been largely replaced by alloy and special steels in the world.

CHAPTER VI

Production and Productivity

Electric pig iron

6.1. The Mysore Iron and Steel Ltd., are pioneers in electric pig iron production in India. Two pig iron furnaces of 13,200 Kva. each were installed in the year 1952. Two more electric pig iron furnaces of 24,000 Kva. each are under construction and are expected to go into production in 1970-71. The total production capacity of the two 13,200 Kva. furnaces is 61,000 tons per annum, apart from the small charcoal or mixed-fuel blast furnace which has a capacity of 24,500 tons per annum. The two 24,000 Kva. electric pig iron furnaces being installed at present will have a capacity of about 1,20,000 tons per annum, increasing the total capacity of pig iron at MISL from 85,500 tons to 2,05,500 tons. The only other electric pig iron furnace in the country is the 15,000 Kva. electric reduction furnace installed recently near Hospet, by the Sandur Manganese and Iron Ores Limited. It has an annual production capacity of 40,000 tons of electric pig iron. This unit produces foundry grade pig iron, low in phosphorus for sale to quality conscious foundries in the country.

From Table No. 7 it will be seen that MISL's production of pig iron of 73,000 tons during the year 1967-68, amounted to just 1 per cent of the total pig iron production in the country, *viz.*, 6.935 million tons during the year 1967-68. The corresponding percentages for HSL, TISCO and IISCO were 57.3, 25.9 and 15.8 respectively.

Production and sales of pig iron

6.2. In the year 1967-68 the total sales of pig iron by MISL amounted to 24 per cent of their total pig iron production as compared to 27 per cent for HSL, 9 per cent for IISCO and 0.2 per cent for TISCO. As shown in the comparative Table No. 7 the quantities

of machine cast pig iron despatched by different steel plants in the year 1967-68 were as follows :

		Tons	*Percentage of total*
HSL	..	10,81,000	90.3
HSCO	..	95,000	7.9
MISL	..	18,000	1.5
TISCO	..	4,000	0.3
Total	..	11,98,000	100.0

Quality and price of pig iron

6.3. The JPC specifications and prices for the large sized blast furnace pig iron are given in Table No. 8. The phosphorus content is considerably lower in electric pig iron than in the cokebased blast furnace pig iron. This is because, impurities such as phosphorus and sulphur get into the metal through the coke which is the main fuel and reducing agent in the case of the big blast furnaces, while in the case of electric pig iron furnaces, electricity is the main fuel and considerably reduced quantity of coke is used as a reducing agent.

The fixed carbon in the coke determines the heating value of the fuel and a certain amount of indirect reduction also takes place by the carbonmonoxide passing through the blast furnace charge. In the electric smelting furnace, electricity largely replaces coke for purpose of heating and coke is used mainly as a reducing agent for direct reduction by the carbon. In an electric furnace, because the proportion of coke required is not much when compared to blast furnace, poorer quality coke can be tolerated. Moreover the high shaft of the blast furnace makes it necessary for the coke to be strong enough to withstand the weight of the burden. Therefore hard metallurgical coke got by high temperature carbonisation in coke ovens becomes essential for blast furnaces. On the other hand, the electric smelting furnace which has a low shaft can use poorer quality coke with lower crushing strength, but having good combustibility and reactivity. Pearl coke (10 to 20 mm) which is a by-product of the coke produced in the coke ovens can be used in the electric smelting furnaces. The smaller size coke is cheaper than the large size nut coke (20 to 40 mm).

Research and development in the field of pre-reduction indicates that decrease in power requirements can be attained by pre-heating and partially pre-reducing the charge in a rotary kiln before feeding it into the electric furnace where smelting is completed. It is estimated that power consumption could be reduced by 40 per cent to 50 per cent in this way, from about 2,500 Kwh. per ton of pig iron to about 1,500 Kwh. But this idea is yet to be used commercially. Its economics under our conditions is yet to be worked out and established. It is possible to manufacture the rotary kiln in India.

It is well known that phosphorus and sulphur have to be reduced to the minimum in quality castings, because both have the effect of making the castings brittle. This also applies to the steel produced from pig iron which is high in phosphorus and sulphur. The phosphorus content in electric pig iron normally ranges from 0.12 to 0.22 per cent whereas the phosphorus content in pig iron from the large coke based blast furnaces is about 0.4 per cent.

The manganese and silicon content in foundry grade pig iron also results in savings in cost of castings. It reduces the need to add ferro-manganese and ferro-silicon to the pig iron which is melted before being cast. Higher temperatures would be required for melting the pig iron when such additions of ferro-manganese and ferro-silicon have to be made. Since much better control over quality and chemical analysis is possible in an electric furnace, pig iron produced from such furnaces is best suited for use by foundries especially those who are particular about the quality of their products.

The foundries and the engineering industries which utilise these products are bound to become increasingly quality conscious. Even at present they are prepared to pay a higher price for foundry grade electric pig iron as compared to the blast furnace pig iron. But as electric pig iron can only be produced in comparatively smaller units, the cost of such production is much higher than that of blast furnace pig iron, where the unit cost is lower as a result of large scale production. Therefore, in order to encourage the production of

electric pig iron, it would be necessary to give it certain concessions and fiscal benefits by ensuring a low rate of power and abolition of excise duty, etc. Even then pig iron production for sale to foundries will be only marginally profitable in view of the capital and power intensive nature of this industry.

The works cost of HSL pig iron may be approximately taken at Rs. 175 per ton excluding depreciation and financial charges as against the selling price of Rs. 330 per ton excluding excise duty of Rs. 40 per ton. But in the case of an electric pig iron unit, the work costs will be roughly double that of the HSL cost. The rate of electricity is a crucial factor as the cost of power is nearly one-third of the total cost of production. The equalised railway freight applicable to HSL for the supply of pig iron is Rs. 46 per ton, as against actual freight of about Rs. 66, 52 and 58 from Bhilai to Bangalore, Bombay and Madras respectively. Excise duty of Rs. 40 per ton is common to both at present. The depreciation and financial charges per ton are likely to be higher for electric pig iron compared to blast furnace pig iron which has the advantage of economies of scale where the overheads can be spread over a much larger tonnage. Mysore State has the advantage of plentiful and relatively cheaper rates of power compared to other parts of the country, and the power cost to electro-metallurgical industries is at present more than 3 paise per unit. If the power rates are higher, it would not be possible to produce electric pig iron on a competitive basis. This is one of the important reasons why licences to produce pig iron have remained mostly unutilised and such electric pig iron production capacity as has been created is only in Mysore State.

The relative economics of blast furnaces and electric pig iron as stated above will be of crucial significance to MISL, Bhadravati, when its two new 24,000 Kva. electric pig iron furnaces go into operation in the near future and more than a lakh tons of pig iron will be available for sale. As a matter of fact more may have to be sold in the open market depending on internal utilisation and especially if the alloy and special steels are largely produced from arc furnaces utilising

scrap which is cheaper. In this context it is important to bear in mind that any industrial recession affects engineering industries first and therefore the demand for foundry grade pig iron. It is well known that during the recent economic recession in the country, the price for foundry grade pig iron was below the minimum workable limits. It is only recently that the demand and the price for pig iron have picked up a little. This trend needs to be carefully watched in the interest of the smooth development of this industry which is of special significance to quality castings and the engineering products. It may be noted that the depreciation and financial charges for the new electric pig iron furnaces at MISL will be higher compared to the old furnaces. Therefore the prices they got for pig iron will have to be correspondingly much higher even to cover their costs of production.

Mild steel

6.4. The mild steel ingot production of MISL during the year 1967-68 was 82,000 tons which amounted to 1.3 per cent of the total all-India mild steel production of 6.25 million tons in 1967-68. The corresponding percentages of HSL, TISCO and HSCO, were 52.2, 30.9 and 12.6 respectively.

MISL's production of saleable mild steel during the year 1967-68 was 72,000 tons which amounted to only 1.6 per cent of the total production of saleable mild steel in the country of 4.63 million tons. The corresponding percentages of HSL, TISCO and IISCO for the year 1967-68 were 52.3, 32.9 and 13.2 respectively. The percentage of semis to total saleable mild steel production by MISL during 1967-68 was as high as 49 as compared to 34 at TISCO.

The published accounts of MISL during the last few years indicate that in the absence of differential retention prices which were based on cost plus basis, and after the big steel plants having low unit costs have gone into operation to meet internal demand, small but relatively high cost units like MISL cannot expect to produce mild steel at competitive prices. It must be clearly realised that MISL has no special advantages in the production of mild steel. That is why, the Union Minister for Steels, Shri C. Subramaniam

categorically advised MISL, when he visited Bhadravati in 1962 to quickly change over from mild steel production to alloy steels. It is unfortunate that the mild steel expansion programme of MISL from 30,000 tons to 1,30,000 tons of mild steel, envisaged towards the end of the 1950s (when there were differential retention prices and scarcity of steel in the country) was completed only in 1965, after the differential retention prices had been abolished in the year 1962 and the production from the big steel plants had started making an impact on the availability of mild steel in the country.

Alloy and special steels

6.5. Details of the iron and steel producing units at MISL are given in Table No. 9. It will be seen from the table that out of a total steel ingot capacity of 1,86,000 tons, 61,000 tons is the capacity of the electric arc furnaces, 80,000 tons of the two 12 ton L.D. converters and 45,000 tons of the two 25 ton open hearth furnaces. There are two 20 ton electric arc furnaces, each with a capacity of 20,000 tons per annum, apart from three other smaller electric arc furnaces with annual capacities of 9,000, 7,000 and 5,000 tons. In short, the electric arc furnaces which are ideally suited for production of alloy and special steels have a capacity of approximately one-third the total steel ingot capacity at MISL.

The production of special steels in the years 1966-67, 1967-68 and 1968-69 were 12,225 tons, 9,775 tons and 23,244 tons respectively, amounting to 16.2 per cent, 10.6 per cent and 24.2 per cent of the total steel ingot production at MISL during each of these years. The percentage of alloy and special steels is expected to increase further during 1969-70. But the bulk of the production will still be mild steels.

The chemical analysis of the special and alloy steels in the production line of MISL are given in Table No. 10. The ISI specifications are given in Table No. 5. It has already been stated that special steels are those in which the control over the different chemical components, and the percentage ranges within which they exist, is much greater compared to mild

steel whereas in alloy steels certain alloys are deliberately added which further enhance the quality of steel. However, in the alloy steels category, low alloy constructional steel constitutes at present the bulk of the demand, while the demand for other high alloy steels is very limited.

It is significant to note that special steels and low alloy constructional steels are at present being produced even in the big sized steel plants, though it is obvious that, in the electric units, there would be better control over quality and production and greater economy in the use of alloys. It should be a matter of policy to encourage special and alloy steel production in the electricity based units and ensure that special steels produced in the larger units, in order to meet the present gap between demand and production, does not, in any way, hamper the speedy growth of alloy and special steel production in electricity-based units. Standardisation of these products and strict control over imports are also very necessary in this context.

As far as MISL is concerned, sooner it achieves complete conversion from mild steel to alloy and special steel production better it is from the point of view of its profitability and financial working. From Table No. 7, it will be seen that 75 per cent of the production of saleable alloy and special steels at Bhadravati was in the form of semis in the year 1967-68 compared to 43 per cent at Alloy Steel Plant, Durgapur in the same year. This indicates that greater attention will have to be paid by MISL to provide the necessary finishing facilities and balancing equipment to maximise sale of these products in a sufficiently finished form, and improve profitability. MISL can become one of the most important alloy and special steel producing units in the country. MISL's production of alloy and special steel ingots was 9,775 tons in 1967-68 as compared to 13,800 tons of Alloy Steel Plant, Durgapur. The saleable alloy and special steel of MISL and ASP for the year 1967-68 were 7,789 and 7,000 tons respectively.

Electric arc furnace

6.6. If the electric arc furnaces are worked to full capacity, there is no reason why MISL should not produce alloy and special steels on a more profitable basis in view of the cheaper electricity rates in Mysore. It is significant to note that the electricity rates for the Alloy Steel Plant, Durgapur, are as high as 9 paise per unit under peak load conditions. But, as can be seen from Table No. 13, the two 20 ton arc furnaces at MISL have not been worked to full capacity during the last two years. During 1967-68 and 1968-69 one of the arc furnaces was worked at 82 and 65 per cent and the other at 50 and 58 per cent of rated capacity respectively. MISL has also found that utilisation of scrap in the arc furnaces is far cheaper than using high cost hot metal from the L.D. converters for the production of alloy and special steels in the arc furnaces. The cost of purchased scrap works out to Rs. 200 to 220 per ton, as compared to an estimated cost of about Rs. 650 per ton of pre-blown hot metal from the L.D. converters.

The cost of steel from the L.D. converters was high because the L.D. converters have been worked to only 27 per cent and 50 per cent of rated capacity during 1967-68 and 1968-69 respectively. The cost of steel from L.D. converters during 1967-68 was as high as Rs. 828 per ton including depreciation of Rs. 105. But even the cost of steel from the old open hearth furnaces, which were worked to more than 90 per cent rated capacity was about Rs. 484 during 1967-68 including depreciation of Rs. 4. As compared to this, the average cost of open hearth steel in the HSL was about Rs. 309 excluding depreciation during 1967-68. In Rourkela, the cost of steel from L.D. converters was about Rs. 322 excluding depreciation during 1967-68.

It may however be noted that as compared to 12 ton L.D. converters at MISL, the converters at Rourkela are of 40 and 60 tons capacity. At Bokaro, L.D. converters will be of 100 tons capacity in the initial stages. According to the current technical trend the economic size of L.D. converters is of the order of 200 to 300 tons and Japan is attempting to instal even larger units. As regards open hearth furnaces,

while the units at MISL are of 25 tons capacity, the capacity of open hearth furnaces in the big steel plants range from 80 to 500 tons. Bhilai has ten open hearth furnaces, five of 250 tons each and five of 500 tons each. MISL cannot afford to ignore the technological advance in the size of these units and their implications on unit cost.

According to an International Survey made in 1968 it was estimated that the world annual capacity of L.D. basic oxygen steel plants in operation was 204 million tons of raw steel which represented an increase of 24 per cent over the previous year's production. New plants in Japan, United States and West Germany are the major contributors to this growth in capacity. World-wide annual capacity is expected to increase to over 300 million tons of L.D. basic oxygen steel in the next several years. Increases of over 5 million annual tons are expected to come from new plants in United States, U.S.S.R., Japan, West Germany and U.K. Capacity increases of 2 million tons annually and over are planned in Argentina, Brazil, Canada, Italy, Netherlands and Spain. Smaller increases are expected in a dozen other countries.

Duplexing

6.7. The process of using pig iron in L.D. converters and the pre-blown hot metal from the L.D. converters in the electric arc furnaces is called Duplexing, as distinct from the single operation of melting steel scrap directly in the electric arc furnaces. The comparative economics of these two processes at MISL is given in Table No. 19. Per ton of steel ingot the cost of scrap is about Rs. 270 as compared to Rs. 380 of pig iron and Rs. 538 of hot metal from the L.D. converters.

In the Duplex process the liquid pig iron is blown in the L.D. converters to bring down the carbon content quickly within the desired range and this pre-blown charge is taken to the arc furnaces for further refining and alloying. In this process the basic raw material is the liquid pig iron, the cost of which at Bhadravati is higher than that of purchased scrap. To this must be added the cost of processing liquid pig iron in L.D. converters before it can be used in the arc

furnace. However the advantages of the Duplex process are :

(1) the pre-blown metal from the converters is purer than scrap ;

(2) when liquid metal is used in the arc furnaces, the duration per heat is shorter than when scrap is used resulting in a higher production.

Inspite of these advantages, the Duplexing process is generally not used because of the prohibitive cost of pre-blown liquid metal as compared to scrap. The MISL is also not using the Duplexing method, but is using scrap in arc furnaces for reasons of comparative cost. But this raises the basic question, *viz.*, what is to happen to the steel produced from the open hearth and L.D. converters. If steel produced from these units is uneconomic compared to steel from the large steel plants and if the steel cannot be economically converted into special and alloy steels then what is to happen to this steel and these units, is the main problem of MISL. The problem is specially acute in the case of the L.D. converters.

It is obvious that it is economical to produce alloy and special steels from arc furnaces using good quality scrap. There is no problem in this regard because good quality scrap is available at economic rates to meet the requirements of MISL. (Details regarding scrap generated within the plant are given in Table No. 11) . There is surplus scrap in the country.

Rolling and finishing facilities

6.8. It is obvious that finished alloy and special steels are more profitable than ingots. The finishing and other balancing equipment for this purpose should therefore be given a high priority. Heat treatment is a part of the process of finishing steel to improve its quality. Heat treatment is a highly specialised field calling for a great deal of experience and broadly includes the processes of cementation, hardening, annealing, quenching and tempering.

The existing capacity of the arc furnaces is 61,000 tons of steel ingots which gives about 40,000 tons of finished steel, on the basis of 60 per cent yield, which

is approximately half the capacity of the new rolling mills. Therefore the capacity of the arc furnaces will have to be eventually increased to match the capacity of the new rolling mills, after such modifications as may be necessary for this purpose. (This, of course, assumes that L.D. converters cannot be used economically for the production of alloy and special steels).

The old rolling mill of MISL has a capacity of 45,000 tons equal to the steel ingot capacity of the open hearth furnaces. The steel making and rolling capacity here are well matched. These are old and almost fully depreciated units. However, in view of the smallness of the unit compared to the large steel plants, it is doubtful if mild steel can be produced economically even in these units. Therefore it should be technically examined as to what steel could be produced economically from the open hearth furnaces and rolled in the old rolling mills with such modifications as may be necessary. The conversion cost from ingot to finished steel is also higher in a small unit compared to the big rolling mills which are designed to roll certain standardized products on a large scale.

L.D. converters

6.9. The extent to which the existing rolling capacities in the old and new rolling mills could be matched with the production from the open hearth furnaces and the electric arc furnaces, has been discussed above. But this leaves out the two 12 ton L.D. converters which have an annual rated capacity of 80,000 tons according to MISL but can produce upto 1,00,000 tons if norms achieved at Rourkela are adopted.

It is true that the L.D. converters were not worked to full capacity mainly because the oxygen plant has not been working satisfactorily, as one of the re-generators has been out of order and not been replaced. If it was found that the re-generator could not be repaired, early steps should have been taken to replace the regenerator, so that the loss on this account could have been largely reduced. There has been prolonged discussions between MISL and the foreign suppliers without any satisfactory solution. The responsibility for the oxygen plant not working satisfactorily is yet to be

established. Even if the oxygen plant and L.D. converters had worked more satisfactorily during the last three years, it is unlikely that the cost per ton would have been lower than the cost per ton of open hearth steel. Normally L.D. steel should be cheaper than open hearth steel as L.D. is a faster process.

The capacity of the oxygen plant is stated to be 9.2 million cubic metres. The actual production in 1967-68 was 7.5 million cubic metres, out of which only 2.6 million cubic metres were utilised and the balance released in the air. Ozygen requirement of the MISL's L.D. converters is stated to be 65 cubic metres per ton. The total requirement of oxygen at MISL is estimated at 6.9 million cubic metres and even assuming that this requirement is fully utilised, there will be a surplus of 2.3 million cubic metres of oxygen. Steps will have to be taken either to fully utilise this capacity if it is possible to do so economically or clearly determine what is to happen to the oxygen plant which depends on the decision regarding the use of L.D. converters for steel making.

It is stated by the MISL authorities that they intend " to make high grade and super grade alloy steels in the arc furnaces, to have better process control and to keep up to the quality. The L.D. plant will be made use of for the manufacture of low alloy special steels, carbon steels and free cutting steels, etc., and gradually reduce the production of mild steel in that unit. Certain modifications and additional equipments are necessary for this change over of production to alloy and special steels. Steps have already been taken to procure such equipments and gradually the production of special and alloy steels in the L.D. converters would be increased." Some attempts have been made to produce special steels from the L.D. converters. Even if some special steels can be produced from these L.D. converters, it is doubtful whether the cost will be competitive. It is certain that both the cost and quality control of producing alloy and special steels in arc furnaces from scrap will be better and more attractive compared to production of special steels from L.D. converters.

A committee of technical experts should immediately go into this question and report to Government regard-

ing the feasibility or otherwise of utilising L.D. converters economically. The book value of the L.D. converters and the oxygen plant as on 31st March 1968 is approximately Rs. 4 crores. But the recurring loss per annum is likely to be more or less of that order if no clear cut decisions are taken in this regard and if MISL continues to ignore the problem which is real and requires immediate solution. The problem is so urgent that it cannot be met by generalisations and it is not at all adequate to state that the production of alloy and special steels in L.D. converters would be increased "gradually". That is why, the Estimates Committee recommends that Government should immediately set-up an expert technical committee including independent experts, to examine and report on this specific problem. The committee should also look into the full implications in terms of cost and profitability and the capital costs of modifications, etc. A close and critical look at the process of MISL's conversion from mild steel to alloy and special steels indicates that the original idea of conversion was based on the duplexing process which fully took into account the production from the L.D. converters. Now that duplexing process has been discarded on grounds of cost, what is to happen to the L.D. converters, should be immediately determined. It cannot be allowed to work at a loss.

Utilisation of pig iron

6.10. Better planning is needed for the production and utilisation of pig iron and iron ore capacities will have to be matched more carefully. The electric arc furnaces which have a capacity of about 61,000 tons will be using about 90 per cent scrap and only 10 per cent pig iron hot metal. This 10 per cent hot metal is less than 10,000 tons. The open hearth furnaces which have a capacity of 45,000 tons, require only 18,000 tons of hot metal as they utilise approximately 66 per cent scrap in the charge and only about 33 per cent hot metal. L.D. converter which utilises only 25 per cent scrap and 75 per cent hot metal requires 70,000 tons of pig iron. In other words the hot metal requirement for internal utilisation is about 25,000 tons without the L.D. converters and about 1,00,000 tons with the L.D. converters. The pig iron production from the charcoal blast furnaces and the two electric pig iron furnaces

installed in 1952 is about 85,000 tons, which is only about 15,000 tons short of the total requirement of MISL, even assuming that L.D. converters can be worked to full capacity on an economic basis. The MISL was known to purchase some pig iron to make up this marginal shortfall.

MISL has now taken up the installation of two new electric pig iron furnaces at an estimated cost of about Rs. 6 crores though it is likely to cost more. These two 24,000 Kva. furnaces will have an extra production of 1,20,000 tons which means that more than one lakh tons of pig iron from these new furnaces cannot be utilised in the plant by MISL, but will have to be sold in the open market to foundries. If L.D. converters cannot be worked economically then nearly 2 lakh tons of pig iron will have to be sold to foundries. At the present level of costs and world prices pig iron cannot be exported profitably.

Furthermore the implications of increase in pig iron production on raw material supply and transport do not seem to have been taken into account. The present iron ore production of the Kemmangundi Mines is about 88,000 tons and 55,000 tons sinter which can just take care of the requirement of the preseut installations at Bhadravati. But when the two new 24,000 Kva. electric pig iron furnaces go into operation, the additional requirement would be of the order of 1.38 lakh tons of iron ore and 60,000 tons of sinter. This means increase in the production of iron ore and sinter by 156 per cent and 109 per cent respectively. This is estimated to involve a capital outlay of Rs. 8 to 10 crores to adequately mechanise and modernise the mines and its transport facilities to cope up with this magnitude of production and movement of ores.

6.11. Some implications of the above analysis are as follows: Some implications

(i) The need to expeditiously step up the production of alloy and special steels to 77,000 tons which is the licensed capacity of MISL. This may involve modifications to the rolling facilities, additions to the

finishing equipment including a Forge Unit and eventually increase in arc furnace capacity.

(ii) An expert technical committee to recommend whether the L.D. converters can be worked economically or not. Consequential steps should also be worked out by this committee in detail.

(iii) The economics of production and sales of steel from open hearth furnaces and the old rolling mills should also be carefully reviewed by the proposed expert technical committee.

(iv) The capital cost implications of producing and transporting adequate quantities of iron ore to meet the full requirement of MISL after the new electric pig iron furnaces go into operation should be realistically estimated and provided for. It is unrealistic to sustain this increased production of pig iron on the basis of iron ore purchased from others. The cost per ton and profitability of the new electric pig iron furnaces should also be worked out in detail on the basis of the current prices and costs because the bulk of this production will have to be sold to foundries as it is far in excess of the internal requirements of MISL.

(v) On the basis of decisions taken on the above main problems, a comprehensive estimate of capital requirements should be drawn up and the Planning Commission and the Government of India should be informed without further delay so that these items get adequate priority in the context of national planning. An integrated project report be prepared for this purpose clearly indicating priorities and profitability.

(vi) Apart from the expert technical committee recommended above for a specific purpose, the Estimates Committee is of the view that the MISL and the Government of Mysore invite a high power committee consisting of the General Manager of the Alloy Steel Plant, Durgapur and some senior executives from HSL and other steel plants, and the Planning Commission, the Ministry of Iron and Steel of the Government of India and some independent technical consultants. Such a high power group should visit Mysore Iron and Steel Ltd., for an on the spot study and general exchange of views. Similarly

a high power team of experienced technical and administrative personnel from MISL and the Mysore Government should visit the Alloy Steel Plant, Durgapur and other steel plants with a view to further strengthen the relationship between MISL and these steel plants.

Performance and production flow sheet

6.12. Table No. 12 gives comparative details of operating units and capacities in different steel plants.

Table No. 13 gives particulars regarding production and performance of the MISL operating units for the years 1967-68 and 1968-69. The critical comments on the performance of different operating units of MISL are given in the remarks column of this table. This clearly indicates that the working of MISL has been far from satisfactory and there is considerable scope for improving both the efficiency and the management techniques. The Committee views with concern this state of affairs and suggests that effective steps are taken to set right the situation.

Table No. 14 gives details regarding the operational efficiency of the MISL on the basis of technical operating norms which are being followed in the various steel plants in the country.

Table No. 15 gives the anticipated production flow sheet as envisaged by the MISL, on the basis of 1,09,000 tons of pig iron for sale, 87,000 tons of alloy and special steels and 39,000 tons of mild steel.

The flow sheet confirms that more than one lakh tons of pig iron will have to be sold to foundries even if it is assumed that the L.D. converters can be worked economically and will utilise 70,000 tons of pig iron. As per the flow sheet, the alloy and special steels production is about 10,000 tons more than the licensed capacity at present, apart from about 39,000 tons of mild steel whose economics and profitability should be carefully looked into in the light of the comments and analysis made in this chapter. It may be further observed that, in the flow sheet as prepared by MISL, the production of the two 25 tons open hearth furnaces is given as 35,000 tons though the

capacity and past production of these furnaces is 45,000 tons. The two smaller 6 and 3½ tons electric arc furnaces are also supposed to produce 11,000 tons of mild steel mainly from scrap, as per the flow sheet, though electric arc furnaces are ideally suited for the production of alloy and special steels. The two 20 ton and one 8 ton electric arc furnaces are supposed to give a production of 60,000 tons according to the flow sheet as against an estimated capacity of 49,000 tons as per Table No. 9 prepared on the basis of data furnished by MISL with regard to rated capacities. The production from the L.D. converters is shown as 70,000 tons in the flow sheet as against 80,000 tons rated capacity as stated in Table No. 9. (It may be noted that applying the norms of similar units in other steel plants and assuming tap to tap time of one hour, the production capacity of the two 12 ton L.D. converters should be 100,000 tons). However, the flow sheet assumes a production of 70,000 tons of special steels from the L.D. converters.

The total raw material requirements according to the flow sheet are 2.26 lakh tons of iron ore, 1.15 lakh tons of sinter, 94,400 tons of limestone and 94,700 tons of coke. The total pig iron production is mentioned as 2.06 lakh tons consisting of 26,000 tons from the charcoal blast furnace, 60,000 tons from the two 13,200 Kva. electric furnaces and 1,20,000 tons from the two new 24,000 Kva. electric furnaces under construction. Of the 206,000 tons of pig iron, it is assumed that 109,000 tons are for sale to foundries, leaving a balance of 97,000 tons for processing into steel. The scrap requirement is given as 1.41 lakh tons and alloys, 13,400 tons. The two open hearth furnaces and the two smaller 6 and 3½ ton electric arc furnaces are anticipated to give a total production of 46,000 tons of mild steel ingots as per the flow sheet. The two L.D. converters, the two 20 ton electric furnaces and one 8 ton electric arc furnace together are anticipated to give a total alloy and special steel production of 1,30,000 tons of ingots. Of this 1,30,000 tons, about 15,000 tons are to be sold as ingots and about 3,000 tons are to be utilised in the steel foundry at Bhadravati. Out of the balance of 1,12,000 tons, 24,000 tons are to be used in the proposed forge shop

to produce about 17,000 tons of finished forged products. The remaining 88,000 tons of alloy and special steel ingots are to be further finished in the heavy section and blooming mill which has a capacity of 84,000 tons, giving a yield of about 74,000 tons. Of this 74,000 tons, 1,000 tons are to be sent to the forge shop and of the balance of 73,000 tons, 38,000 tons will be sent to the combined bar and rod mill and about 34,000 tons sold as billets. The combined bar and rod mill as per the flow sheet receives 1,000 tons from the forge shop apart from 38,000 tons from the blooming mill and finally produces 36,000 tons of alloy and special steels finished sections. To sum up, 1,12,000 tons of alloy and special steel ingots, finally result in 17,000 tons of finished forged products, 36,000 tons of finished sections and 34,000 tons of billets, giving a total of 87,000 tons as against the licensed capacity of 77,000 tons.

Apart from the alloy and special steel programme of 87,000 tons, 46,000 tons of mild steel ingots from the two open hearth furnaces and the two smaller electric arc furnaces are to be finished in the old rolling mill and the strip and rod mill to give 39,000 tons of mild steel finished sections. The old rolling mill has a capacity of 30,500 tons and an yield of 26,700 tons. The strip and rod mill has a capacity of 15,500 tons and an yield of 13,550 tons.

This flow sheet does not squarely face the problem of whether the use of L.D. converters and the mild steel production are economical or not. The anticipated flow-sheet as prepared by the MISL tries to mechanically match physical capacities without clearly and convincingly indicating whether such a product-mix would be profitable. Since the productive units both in the private and public sectors are expected to work profitably and, if possible, contribute to internal resources for expansion, the proposed product-mix of MISL should be judged on this basis. The Board of Directors of the MISL should take immediate steps to work out the profitability of the proposed product-mix in detail. This assumes special significance because profitability would be absolutely necessary to get financial assistance. Finances will

have to come mainly from the Government of India and the financial institutions in view of the limited resources of the State Government. The gestation period for such development should be carefully taken into account and the capital investment planned accordingly. Unrealistic under estimation of capital requirements for the completion of such a programme may result in unnecessary waste and avoidable financial losses. The Estimates Committee is of the view that, in the ultimate analysis, the MISL need not work at a loss and can make reasonable profit if the steps indicated in this report are taken without any further loss of time.

It will be seen that it is the limited capacity in the rolling mills that makes this flow sheet provide for 18,000 tons of alloy and special steel ingots to be sold as ingot. The proposed sale of 34,000 tons of alloy and special steel as billets also reflects inadequacy of finishing facilities for this programme. Moreover, whether the L.D. converters can at all be used economically in this manner is a matter to be examined and finally determined by an expert technical committee as recommended by this committee.

As regards the rolling mills, it can be generally stated that there is scope to increase the capacity by adjusting the number of passes and adding to the number of stands, etc. A certain amount of excess rolling capacity enables greater diversification and quick change-over from one product to another to meet market requirement. In this sense, a slight excess capacity in rolling mills is not so disadvantageous as inadequacy in rolling capacity. In the large integrated steel plants there is generally planned excess capacity in the primary rolling mills in order to take into account the increased production of ingots in the future.

If it is found by the expert technical committee that the L.D. converters cannot be economically accommodated in MISL's production flow sheet in this manner, it might become necessary for MISL to think of adding one or two 50 to 60 ton electric arc furnaces or, if feasible, one 100 to electric arc furnace in order

to produce the licensed capacity of alloy and special steels solely from arc furnaces. If additional arc furnaces are installed as suggested above, the total arc furnace ingot capacity will increase from about 60,000 tons to 160,000 tons, of which about 24,000 tons will go to the forge shop as envisaged in the MISL flow sheet, leaving a balance of about 136,000 tons of alloy ingots. On the basis of 60 per cent yield, 136,000 tons of alloy and special steel ingots will result in about 80,000 tons of finished products which corresponds to the licensed capacity of MISL.

Mr. M. M. F. Tourssaint writing on electric arc furnaces in his book 'Ore to Steel' states "The opinion previously held that steel of uniform quality including only very little slag could only be manufactured in small furnaces has not been substantiated. Past experience has shown that high quality steels, capable of meeting even the most exacting specification, can also be made in large furnaces. As a result of the powerful currents adopted in these large furnace units, the bath is intensively stirred and the interface contact between the slag and the steel gratly improved. Furthermore, 'slag inclusions' were eliminated as metallurgists learnt to control the metallurgical process. Thus, the original 2 to 5 ton furnaces were gradually abandoned in favour of units of up to 200 tons capacity". .. "Electric-arc furnace is particularly suited for the manufacture of alloy steels, as the alloying elements (chromium, vanadium, tungsten and molybdenum) are added under reducing conditions that give a high efficiency of recovery. The importance fo this fact, particularly for re-melting alloy steels. requires no emphasis. The metallurgical superiority of the electric furnace is generally recognised to-day. As gases cannot enter the furnace and the ingress of atmospheric oxygen is practically avoided, the conditions inside the electric furnace are non-oxidising. Thus the steel does not undergo any change during the refining process, and the harmful elements such as phosphorus, sulphur and oxygen can be safely removed so that only a few traces of them are left in the steel. The metallurgical processes can be closely controlled by the smelter. Samples can be taken and adjustments made at any time of the

process. For this reason, high-grade carbon and alloy steels are today almost exclusively made in electric furnaces".

The rolling and finishing facilities at MISL will have to be reassessed from this angle. The old rolling mill including the strip and rod mill can take care of the production from the open hearth furnaces. The new rolling mills and the combined bar and rod mill can produce 36,000 tons of finished sections and 34,000 tons of billets. This indicates that the rolling and finishing capacity needs to be increased and suitably modified to meet the requirements of producing 77,000 tons of alloy and special steel finished products which are more profitable than sale of billets. The fact that the MISL's anticipated production flow sheet envisages 34,000 tons of alloy and special steel billets and 15,000 tons of alloy and special steel ingot for sale, is a measure of the inadequacy of finishing facilities. The inadequacy would be greater if it had not been assumed that 24,000 tons of alloy and special steel ingots would be needed for the proposed forge shop. The detailed break-up of the licensed capacity may also have to be revised in the light of the final decisions that may be taken by the MISL and the Government in this regard.

CHAPTER VII

Financial Aspects

Profit and loss

7.1. An analysis of income and expenditure of MISL for the six year period 1962-63 to 1967-68 is given in Table No. 16. These figures have been taken from the published accounts of the Mysore Iron and Steel Limited. For the year 1967-68, the loss is shown as Rs. 2.11 crores. This loss is after transferring to the capital account Rs. 1.20 crores of interest payable for the year. Payment of interest should normally form part of the current expenditure. If the interest of Rs. 1.20 crores had not been capitalised, the loss for the year would have been Rs. 3.31 crores and not Rs. 2.11 crores. Similarly for the previous years, the figures given as profit will have to be readjusted in order to get a realistic picture of the profit or loss incurred in each of these years. For the year 1962-63, the profit is shown as Rs. 65 lakhs, but this is after capitalising Rs. 12 lakhs of interest and Rs. 43 lakhs supposed to be spent on development and minor capital expenditure. For the year 1963-64 the profit is shown as Rs. 70 lakhs, after capitalising interest to the extent of Rs. 28 lakhs and minor development expenditure of Rs. 46 lakhs. For the year 1964-65 the profit is shown as Rs. 69 lakhs. However, during the year 1964-65, Rs. 43 lakhs of interest and Rs. 2 lakhs of miscellaneous expenditure were capitalised. This interest and miscellaneous expenditure rightly belong to the revenue expenditure and should not have been capitalised. The Company unnecessarily becomes liable to taxation by showing a profit as a result of capitalising items such as interest which are clearly chargeable to revenue expenditure and deductable before arriving at taxable profit. The profit for the year 1965-66 has been shown as Rs. 52 lakhs, but during this year the interest capitalised was Rs. 61 lakhs and expenditure on trial operations capitalised was Rs. 30 lakhs (out of a total trial operations expenditure of Rs. 129 lakhs). Depreciation not charged to the profit and loss account for the year

was Rs. 60 lakhs. If this depreciation of Rs. 60 lakhs had been provided and if the interest of Rs. 61 lakhs had not been capitalised, the loss for the year would have been Rs. 69 lakhs and not a profit of Rs. 52 lakhs. For the year 1966-67, the profit of Rs. 44 lakhs has been arrived at after capitalising Rs. 121 lakhs of interest and Rs. 68 lakhs of trial operations expenditure (out of a total trial operations expenditure of Rs. 172 lakhs). Depreciation not charged to profit and loss account for the year 1966-67 was Rs. 64 lakhs. If depreciation had been provided for and interest not capitalised, the real loss during the year 1966-67 would have been Rs. 141 lakhs and not a profit of Rs. 44 lakhs. As already stated, the real loss for the year 1967-68 is of the order of Rs. 3.31 crores instead of Rs. 2.11 crores. On this basis, the total loss during the three years ending 1967-68, was of the order of Rs. 5.41 crores. The Estimates Committee is of the opinion that it was a short sighted policy to try to show profits or minimise losses on paper by capitalising items which could have been legitimately charged to the revenue account. It is significant to note that the total interest capitalised during the six years ending 1967-68 was about Rs. 3.85 crores apart from expenditure on trial operations, etc., capitalised of Rs. 1.89 crores. The loss during 1968-69 was Rs. 3.06 crores after capitalising expenditure of Rs. 1.29 crores.

Comparison of profit and loss

7.2. A comparative analysis of the income and expenditure figures for the year 1967-68 for MISL, IISCO, TISCO and HSL are given in Table No. 17. It would be seen from these figures that while IISCO and TISCO did not make any loss during the year, MISL made a loss of Rs. 2.11 crores after capitalising interest of Rs. 1.20 crores and HSL a loss of Rs. 40.12 crores.

The percentage of each category of cost to total cost for each of these steel plants is also given in Table No. 17. From this it would be seen that for HSL, depreciation amounts to about 15 per cent of the total expenditure as compared to 9.3 per cent for TISCO, 9 per cent for MISL and 6 per cent for IISCO. This is because the HSL plants are new compared to

MISL, IISCO and TISCO. Interest constitutes 12.3 per cent of total cost for MISL as compared to 8.6 per cent for HSL, 3.2 per cent for IISCO and 2.2 per cent for TISCO. This clearly shows that the burden of interest payment is heavy on MISL and steps will have to be taken to keep it within reasonable limits. The percentage of excise duty to total expenditure is 8.5 in the case of MISL as compared to 9.4 for HSL, 11.4 for IISCO and 17.7 for TISCO. The expenditure on stores, spares, maintenance and repairs accounts for 11.6 per cent of total expenditure in the case of MISL as compared to 9.8 per cent for TISCO, 11.7 per cent for HSL and 21 per cent for IISCO. The expenditure on wages and salaries works out to 15 per cent of total expenditure for MISL as compared to 13.8 per cent for HSL. The cost of raw materials, power and fuel amounts to 38.5 per cent of total expenditure in the case of MISL, as compared to 23.9 per cent for IISCO, 27.7 per cent for TISCO and 26.2 per cent for HSL. These costs are the highest for MISL mainly because it is an electricity based plant where the cost of power and fuel alone works out to 24.3 per cent of total expenditure. In the case of the coke based integrated steel plants the coke oven gas available to them also results in economy in fuel costs. This clearly brings out the cost disadvantage of an electricity based steel plant as compared to the other plants with regard to raw materials, power and fuel, without any compensating advantage in respect of other categories of cost. This will have to be clearly recognised and taken into account in any realistic policy with regard to the development of iron and steel industry, in the country. Otherwise, the need to diversify the iron and steel industry and enable it to grow in different States by encouraging electricity-based iron and steel production will remain largely unfulfilled and the real economic and financial problems faced by such units will remain unsolved.

Product-wise profitability 1967-68.

7.3. A productwise or unitwise assessment of profitability at MISL clearly indicates that for the year 1967-68 the main item which made a distinct profit of about Rs. 56 lakhs was the production from the ferro-silicon plant—*vide* Table No. 18. The

foundry also made a profit of about Rs. 12 lakhs. All other items of production were extremely weak from the point of view of profitability, except the sale of pig iron where there was a marginal profit after adjustment of stocks. (The previous year's stocks were valued at rates lower than the cost of production for the year 1967-68 and the sales for the year were taken to be first from the previous year's stocks). The average sale price realised for pig iron during 1967-68, excluding excise duty of Rs. 40, was about Rs. 330 ex-works as against the JPC price of Rs. 320 F.O.R. destination excluding excise duty. However, charcoal pig iron fetched a somewhat better price of Rs. 407. But the cost of charcoal pig iron was also distinctly higher than the pig iron from electric furnaces. It should be kept in mind that the year was one of industrial recession which particularly affected the engineering industries and demand from foundries. The result was that electric pig iron which is superior in quality compared to the big blast furnace pig iron did not fetch the premium that it ought to under normal conditions. The total quantity of electric pig iron sold during 1967-68 was 11,836 tons as compared to about 6,000 tons of blast furnace pig iron. The total sale value realised for electric pig iron and blast furnace pig iron was about Rs. 40 lakhs and Rs. 24 lakhs respectively. The total profit from pig iron after adjusting stocks as stated above was about Rs. 6 to 7 lakhs.

Products from the old rolling mill resulted in a loss of about Rs. 12 lakhs including a loss of about Rs. 1.4 lakhs on special steels before stock adjustment. 17,831 tons of mild steel sections were sold for a total sale value of Rs. 118 lakhs which worked out to an average sale price per ton of Rs. 661 excluding excise duty. 790 tons of special steel sections were sold for at a total sale value of Rs. 7.29 lakhs, at an average sale price of Rs. 923 per ton excluding excise duty. The coils and hoops from the strip and rod mill made a profit of only Rs. 34,000 during the year 1967-68. 9,600 tons of coils were sold at a total sale value

of Rs. 73.63 lakhs at an average price of Rs. 767 per ton. 94 tons of hoops were sold at an average price of Rs. 980 per ton.

Mild steel blooms, sections and billets and special steels from the new rolling mills also resulted in sizeable losses amounting to a total of Rs. 2.86 crores. Mild steel billets alone resulted in a loss of Rs. 1.20 crores and special steel also incurred a loss of about Rs. 16 lakhs. 28,717 tons of mild steel billets from the new rolling mills were sold for a total sale value of Rs. 143 lakhs at an average sale price of Rs. 498 excluding excise duty. Similarly 4,286 tons of special steel sections from the new rolling mills were sold at an average sale price of Rs. 1,004 excluding the excise duty, for a total sale value of Rs. 43 lakhs. A close examination and scrutiny of these costs and prices is absolutely necessary in view of the fact that the anticipated production after the conversion programme of the MISL has been completed, lays emphasis on the production of special steels and also envisages mild steel production. Starting from these costs, it is necessary to clearly establish the profitability of producing special and mild steels in this manner. The pipe foundry and spun pipe plant has also resulted in a loss of about Rs. 11 lakhs in 1967-68. In other words, it is only the ferro-silicon production that has worked profitably. However, in view of the limited demand for ferro-silicon as estimated by the NCAER, careful assessment of the anticipated demand including exports should be made before expanding the ferro-silicon capacity at Bhadravati, on the basis of a detailed project report.

Economics of electric arc furnace

7.4. The economics of electric arc furnace for the production of alloy and special steels (*a*) using scrap, (*b*) duplexing LD metal is given in Table No. 19. It would be seen from the Table that the cost of alloy steel from the two 20 ton arc furnaces using scrap can be brought down to about Rs. 680 per ton, which is only marginally more than the estimated cost of mild steel production from the two 12 ton LD plants when worked to full capacity. It is significant to note that production of alloy steels from arc furnace by duplexing LD metal is Rs. 988 per ton which is

about Rs. 300 more than the cost of making alloy steels from scrap. This price difference per ton is there in spite of a much higher production from arc furnaces on the basis of LD metal as compared to the use of scrap.

The arc furnaces producing alloy steels with scrap have an annual capacity of about 42,000 tons. This capacity goes up to about 74,000 tons, *i.e.*, by 76 per cent if LD metal is used instead of scrap, but the cost per ton also goes up by about 45 per cent. Table No. 19 is pointedly discussed here because the future of MISL depends greatly on a realistic assessment of the relative costs and profitability of these items of production. This table assumes full capacity production in order to give the most favourable picture regarding costs and in order to remove any distorted impression that might be created by the very high cost of production in 1967-68 due to under-utilisation of capacities. It may however be noted that the total costs as worked out in this Table are exclusive of excise duty. The figures of cost in this table are as given by MISL.

Balance sheet for the year 1967-68

7.5. The break-up of the Balance Sheet for the year 1967-68 is given in Table No. 20. The cash flow statement for the year 1967-68 is given in Table No. 21. From these figures, it will be seen that the total assets and miscellaneous items amount to Rs. 51.48 crores of which fixed assets (net after depreciation) amount to Rs. 17.77 crores and the investment and current assets are Rs. 11.48 crores. However Rs. 22.23 crores is shown as capital works in progress. It is important for MISL to carefully analyse and keep a close watch on the large sums shown under capital works in progress apart from the net fixed assets. It is important also that the gestation period is kept down to the minimum and profits are earned as early as possible in respect of the new units in order to get the benefit of the development rebate allowance. The development rebate allowance is 35 per cent on plant and machinery installed before 1st April 1970 and 25 per cent thereafter according to the 1969 Finance Act. There is no development rebate allowance on buildings. The development rebate allowance to be availed of as

on 31st March 1968 is given as Rs. 1.73 crores. On the capital works in progress of Rs. 22.23 crores, the development rebate may be very roughly assumed at a minimum of about 20 per cent after making allowance for buildings and other items which are not eligible for development rebate allowance. The development rebate allowance at 20 per cent on Rs. 22.23 crores may be approximately taken as Rs. 4.44 crores, apart from Rs. 1.73 crores of development rebate which has already accrued and has not been availed of as on 31st March 1968. This makes a total of about Rs. 6 crores which the Company is entitled to claim before arriving at taxable income. But the development rebate allowance has to be claimed within 8 years from the installation of each item of Plant and Machinery. In other words, if the Company does not make adequate profits within 8 years of the installation of Plant and Machinery to be able to claim and absorb this development rebate reserve allowed to it, in addition to depreciation, etc., the amount will lapse thereby weakening the capacity of the industry to build up internal resources. Moreover, it is only after wiping off the previous losses and providing for full depreciation that the development rebate can be claimed.

During 1967-68 MISL obtained unsecured loans of Rs. 12.97 crores including Rs. 8.75 crores from Government of India and Rs. 3.17 crores from German Bank (KFW). This, together with the depreciation for the year of Rs. 1.46 crores, was utilised towards addition to fixed assets and capital works in progress of Rs. 8.44 crores, reduction in secured loans of Rs. 3.95 crores and loss of Rs. 2.11 crores. The loan from Government of Mysore and dues by MISL to Mysore Government towards interest, supplies and services aggregating Rs. 10.18 crores were converted into share capital deposit during 1967-68.

Stores and spares consumed during 1967-68 increased by Rs. 38 lakhs, *i.e.*, 43 per cent in spite of there being no corresponding increase in production. This indicates the scope for more efficient utilisation of stores and spares and for a proper inventory control.

Debt-equity ratio

7.6. It has already been pointed out that the percentage of interest to total costs in the case of MISL is distinctly higher than in the case of other steel plants. This is largely because the debt-equity ratio of MISL is extremely unfavourable as can be seen from the figures given below.

Year	*Debt (Rs. Crores)*	*Equity (Rs. Crores)*	*Debt-equity ratio*	*Total Investment (Rs. Crores)*
1965-66 ..	17.59	4.00	4.3:1	21.59
1966-67 ..	29.78	5.97	5:1	35.75
1967-68 ..	31.26	16.15	2:1	47.41

Debt-Equity Ratios of MISL and other steel plants are given below.

Year	*MISL*	*HSL*	*TISCO*	*IISCO*
1965-66 ..	4.3:1	0.82:1	0.77:1	1.35:1
1966-67 ..	5:1	0.95:1	0.94:1	1.14:1
1967-68 ..	2:1	0.98:1	0.90:1	1.37:1

From these figures it will be seen that in the case of TISCO and HSL the equity finance is more than debt whereas in the case of MISL equity is only half the debt amount. The Committee on Public Undertakings of the Lok Sabha in their 28th Report of April, 1966 on the Hindustan Steel Limited have stated that the debt-equity ratio should be 1:1. One way to improve the debt-equity ratio of MISL is to request the Central Government to convert its loan into equity capital. Central Government's loan to MISL as on 31st March, 1968 was Rs. 11 crores. If this loan is converted into equity, aggregate share capital of MISL will be Rs. 27 crores, and loan capital Rs. 20 crores, thereby making the equity-debt ratio better than 1:1. During our discussions at the Planning Commission Prof. D. R. Gadgil, Vice-Chairman, Planning Commission indicated that there need not be any undue rigidity with regard to the Central participation in the equity capital of

State public undertakings. The suggestion with regard to the conversion of Government of India loan to equity is fully in keeping with the latest thinking of the Government of India in this regard. Consequently, Government of India may want to participate more actively in the management of MISL. The conversion of Government of India loan to equity will help in making MISL a viable unit by reducing its disproportionate burden of interest charges.

Capital cost of conversion programme.

7.7. The MISL estimated the capital cost of the conversion programme to alloy and special steels, to be Rs. 36.35 crores, out of which Rs. 23.04 crores have been spent by March, 1968 and another Rs. 6.58 crores during 1968-69. The break-up of this expenditure of Rs. 29.62 crores is given in Table No. 2. The balance requirement according to the MISL is Rs. 6.73 crores. It is not clear from where this balance amount is to come. Moreover the actual capital cost of conversion is likely to be more than what has been estimated by the MISL. For instance, the conversion programme includes a forging unit of 17,000 tons. The capital cost required for this purpose has not been taken into account. Considering that the forging plant at the Alloy Steel Plant, Durgapur, with a finishing capacity of 3,500 tons has costed Rs. 4.50 crores in 1965-66 before devaluation, a bigger forge shop at Bhadravati may cost about Rs. 8 to 10 crores now, if it is to be properly equipped. For the mechanisation of the mines at Kemmangundi and the augmentation of transport facilities to attain self-sufficiency with regard to the supply of iron ore after the two new electric pig iron furnaces at MISL go into operation, a capital outlay of about Rs. 8 to 10 crores will be required. This item has also not been taken into account in the MISL's estimate of capital cost of Rs. 36 crores as given in Table No. 2. These capital cost implications of the future plans and programmes of MISL should be carefully looked into. MISL should concentrate on alloy and special steel production from the arc furnaces based on scrap and, funds permitting, increase this capacity to make more sophisticated and specialised steel instead of diffusing its efforts and financial capacities in pursuing less profitable programmes. A forging shop is a good

idea and mechanisation of mines and increasing transport facilities will become inevitable to feed the two new 24,000 Kva electric pig iron furnaces. Further capital for increasing arc furnace capacity and improving the rolling and finishing facilities is likely to be of the order of Rs. 15 to 20 crores. This will depend on the final decisions that will have to be taken after the proposed expert technical committee makes its recommendations on some specific issues indicated in this report. This means that the additional capital requirement to take the conversion programme already started to its logical conclusion will require an additional Rs. 35 to Rs. 40 crores and not just Rs. 6 to 7 crores as now estimated. This additional capital requirement of Rs. 35 to 40 crores does not include the capital requirement of the proposed expansion of ferro-silicon production capacity which according to MISL will be done largely from a foreign loan which is being negotiated and which is proposed to be repaid by the export of ferro-silicon. This capital will have to come largely from the Government of India and the financial institutions in view of the slender resources of the State Government. However this capital has to be intelligently and effectively phased over a reasonable period by suitably dovetailing priorities. Obviously, production and finishing of alloy and special steels at least to the extent of licensed capacity of 77,000 tons should receive the highest priority as that is most important from the point of view of MISL's profitability and viability. If the MISL had concentrated on equipping itself for the production of alloy and special steels and had fully realised that certain other products such as mild steel are not likely to be profitable but result in serious losses in the years to come, MISL would have been in a much better position to-day. At least now a bold and realistic attempt should be made to see what is profitable and what is not and accept its full implications even if it means a certain amount of amputation. In the long run, such a realistic approach will be less painful than merely continuing production on the old basis. There is scope at Bhadravati to improve not only utilisation of capacity but also the value of the product-mix which is what counts from the point of view of financial viability and strength. There is no

point in continuing production of certain items at a heavy loss. MISL and Mysore just cannot afford it.

The broad estimate of Rs. 35 to 40 crores of additional capital outlay required is not unrealistic considering that in Japan the capital investment per ton of alloy steel ingot works out to approximately Rs. 4,500. Under Indian conditions, taking into account the capital cost of imported items including import duty etc., the total capital cost per ton of alloy steel ingot works out to approximately Rs. 6,000 to Rs. 6,500 per ton after devaluation. The licensed capacity of MISL is 77,000 tons of finished alloy and special steels, *i.e.,* about 1,30,000 tons of alloy steel ingots as already stated. On the basis of capital investment of Rs. 6,000 per ton of alloy steel ingot, it amounts to about Rs. 78 crores. Apart from the present estimate of Rs. 36 crores required for the conversion programme, it has been suggested in this report that an additional Rs. 35 to 40 crores would be necessary to effectively and realistically complete the programme and put MISL on a sound and profitable basis. The total investment thus estimated also approximates closely to the figure of Rs. 6,000 to Rs. 6,500 per ton of alloy steel ingot. Investment of this order will be ultimately required in view of the fact that apart from about 77,000 tons finished alloy & special steels, the two new 24,000 Kva. electric pig iron furnaces (with a total capacity of 1,20,000 tons which will have to be sold mostly to foundries as this is largely unconnected with the conversion programme), necessitates an additional outlay of about Rs. 8 to 10 crores to mechanise and modernise the mines and transport to ensure adequate supplies of iron ore. On these two electric pig iron furnaces the estimated investment is about Rs. 6 to Rs. 7 crores, though it is likely to cost more. It is important that investment of this magnitude of Rs. 70 to Rs. 80 crores should not be done in a haphazard, unplanned manner but on the basis of an integrated project report which takes into account all the various factors and carefully dovetails investment and profitability on a realistic basis.

CHAPTER VIII

Raw Materials

Costs

8.1. The cost of the raw materials for the iron and steel industry in India increased during the last two decades more rapidly than in other steel producing countries in the world. The increase in costs of raw materials has more than offset the technological improvements in the utilisation of raw materials per ton of finished product. The raw material cost excluding power and fuel constituted about 14 per cent of the total expenditure at MISL in the year 1967-68 and 38 per cent including power and fuel. The Government of India Committee on the cost of production of steel (Mahatab Committee), in its report published in 1966 stated that increase in the actual cost of steel ingot in 1964-65 over 1948-49 (excluding Excise duty) was about Rs. 151, *i.e.*, an increase of 158 per cent. Of this total increase in the cost of ingot, 68 per cent was attributable to increase in the cost of raw materials including fluxes.

The freight component in the cost of raw material is also very important and varies for different plants depending on the distance and transportation charges of raw materials. In the case of MISL, the transportation charges appear to be as high as 40 per cent of the total cost of iron ore, sinter, coke, quartz and manganese. According to the Mahatab Committee Report, the freight element on the main raw materials consumed by the integrated steel plants varied from 15 per cent to 19 per cent.

The quantities of raw material used per ton of pig iron by the different steel plants, including MISL, in the year 1965-66, are given in Table No. 22. From these figures, it will be seen that while coke constitutes 28 to 32 per cent of the total charge in the large sized blast furnaces, it is about 20 per cent in the case of MISL. MISL consumed about 525 kg. of coke per ton of pig iron in 1965-66 as compared to 800 to 940 kg.

per ton in the large integrated steel plants using large coke-based blast furnaces. This is because MISL concentrates on electric pig iron with a view to replace as much coke as possible by electricity. In the case of Japanese blast furnaces the coke rate has been reduced to 400 to 450 kg. per ton.

The coke consumed per ton of hot metal in the Indian blast furnaces is approximately 850 kg. per ton. At MISL, the coke rate per ton of hot metal is approximately 500 kg., because of the use of electric furnaces resulting in a saving in coke of about 350 kg. per ton. However this is more than offset by nearly Rs. 20 by way of increased transport charges. In addition about 2,500 to 2,700 Kwh. of power is used per ton of pig iron and this power costs Rs. 80 to Rs. 90. In other words, the total cost of coke and electric power per ton of pig iron is about Rs. 100 more at MISL compared to other plants. This again points to the great need to maintain the electricity rates at a competitive level. Otherwise iron and steel production in the regions which are far away from the coal fields becomes prohibitively expensive.

8.2. Iron ore is a very important raw material. Good quality iron ore with more than 60 per cent Fe content is available in Mysore State. The present requirement of MISL is about 88,000 tons of iron ore. The average consumption of iron ore from the Kemmangundi mines was about 66,000 tons during the period 1962-63 to 1965-66. The iron ore consumed in 1967-68 was about 94,000 tons. The iron ore purchased during the period 1962-63 to 1965-66 on an average was about 27,000 tons per annum. The average sinter consumption per annum during the period 1963-64 to 1967-68 was 33,000 tons. Details of these figures are given in Table No. 23. However, after the two new 24,000 Kva. electric pig iron furnaces go into operation, the additional iron ore required is estimated at 1.38 lakh tons making at total of 2.26 lakh tons of iron ore per annum including the present requirement of 88,000 tons. Iron ore and sinter

The present requirement of sinter is about 55,000 tons. After the two new electric pig iron furnaces

go into operation, another 60,000 tons of sinter will be required thus making a total of 1.15 lakh tons. However, the capacity of the sintering plant is only 80,000 tons. 1.3 tons of fines gives 1 ton of sinter. On this basis 80,000 tons of sinter will require 1.04 lakh tons of fines. The normal ratio of iron ore to fines at Kemmangundi is approximately 4 : 1, *i.e.,* every ton of iron ore mined results in about 0.26 ton of fines. In order to get 1.04 lakh tons of fines, 4 lakh tons of iron ore will have to be mined consisting of 2.96 tons of lump iron ore and 1.04 lakh tons of iron ore fines for sintering. If only 80,000 tons of sinter is assumed against the requirement of 1.15 lakh tons, the difference of 35,000 tons will have to be added to the iron ore requirement which gets increased correspondingly from 2.26 lakh tons to 2.61 lakh tons leaving a balance of about 35,000 tons of lumpy ore for any additional requirement. This means that the proportion of iron ore to sinter will have to be higher than approximately 2 : 1 unless the sintering capacity is increased. These figures indicate that iron ore production of about 4 lakh tons per annum including fines would be needed to meet the requirements of the programme as given by MISL and indicated in Table No. 15. The capacity of the rope-way is sufficient to cope with 4 to 4.5 lakh tons of uncrushed iron ore per annum. During 1968-69, the quantity of iron ore mined was only 1.25 lakh tons. But the future programme as given by MISL will require an iron ore production of about 4 lakh tons. This will obviously require mechanisation of the mines and strengthening the transport facilities. The bulk of this requirement of about 4 lakh tons will have to be mined by MISL.

With regard to the self-sufficiency of iron ore and dependence on purchased ore, the Mahatab Committee has stated as follows : " The dependence by the steel works on purchased ore should essentially be a transient phase in their own interest. The steel works are bound to restrict this to the minimum and to become self-sufficient in regard to their iron ore requirements at the earliest ".

This committee is also of the view that the mines should be mechanised and should work towards reducing cost by fuller utilisation of equipment and improved

productivity. Of course the cost of mining and transport vary according to different conditions. At Bhilai there was a difference of about Rs. 3.5 per ton between the mechanised and manual mining costs in 1964-65. The cost of crushed ore at Bhadravati in 1967-68 was Rs. 36.74 per ton, including mining cost of Rs. 21.30 and transport cost of Rs. 10.47 as can be seen from the figures given below :

		Rs. P.
Mining cost	..	21.30
Transport cost	..	10.47
Royalty	..	1.00
Depreciation	..	3.97
Total	..	36.74

The cost per ton of iron ore should be studied and lowered by mechanisation and better transport facilities. The National Mineral Development Corporation (NMDC) had been approached by the MISL for technical advice on mechanised production of iron ore to meet the increased requirements. The proposals of the NMDC have been under consideration since 1966. The present crushing and screening plant has an estimated capacity of about 1.92 lakh tons. It will therefore be necessary to instal one additional crusher in order to double the capacity to cope up with the increased requirements. The cost of this additional capacity of crushing, screening and washing plant is estimated at Rs. 3 crores. The present transport system from Tanigebyle to Bhadravati consists of narrow-gauge railway line belonging to the company. This has a transport capacity of not more than 2 lakh tons per annum. In order to double this capacity, it may be necessary to convert this railway line to a metre-gauge one necessitating replacement of existing locomotives and rolling stock. All these developments including mechanisation of the mine, conversion to metre-gauge and installation of additional crushing, screening and washing capacity is likely to cost about Rs. 8 to 10 crores. The estimated figure of Rs. 6.25 crores given by MISL appears to be low.

Sintering plant has been closed down because of non-availability of rotor spare parts which it is stated has to be imported. However, the cost of sintering has to be fully examined and technical advice sought with regard to the use of sinter and ore in certain optimum proportions, taking into account the relative cost of ore and sinter.

" Sintering is done by mixing the fine ore with about 10 per cent of coal, igniting a thin layer of this mixture and burning the coal by drawing air through this layer. The temperature thus produced is sufficient partly to melt some of the minerals in the ore and produce a strong cellular cake of excellent physical characteristics for introduction into the blast furnace ". In this way, sinter-agglomerates improve the burden and working of the furnaces and enable utilisation of iron ore fines, coke fines, powdered limestone, etc., which would otherwise be wasted, thereby improving the economics of both mining and sintering.

The percentage of sinter to iron ore used in different steel plants is as follows :

MISL	ROURKELA	BHILAI	TISCO
45 to 50	50 to 60	45 to 50	25 to 30

During 1966-67, the quantity of iron ore and sinter per ton of pig iron at MISL was 1,016 kg. and 470 kg. respectively, as against 1,353 kg. of iron ore and 166 kg. of sinter per ton of pig iron during the year 1967-68, because the sinter plant did not work fully. The total cost of these two raw materials per ton of pig iron was about Rs. 52 in 1967-68 as compared to Rs. 50 in 1966-67. This indicates that the optimum proportion in which the iron ore and sinter should be used will have to take into account the relative cost of those two raw materials, in view of the fact that sinter costs more than double that of iron ore. This is a matter of costing because the two are inter-related products. However, an increased input of sinter appreciably reduces the consumption of coke and at the same time increases the pig iron production rate.

The percentage of the cost of each of the main raw materials used to the total works cost excluding the depreciation, over-heads, financial charges and excise duty, for the years 1966-67 and 1967-68 is given in Table No. 24.

Coke

8.3. The coke rate per ton of pig iron at MISL varied from 525 kg. in 1965-66, 518 kg. in 1966-67 and 441 kg. including 131 kg. of lignite in 1967-68. The percentage reduction in coke rate per ton of pig iron in 1967-68, as compared to 1966-67 was 14 per cent. But the increase in rate or cost per ton of coke was 20 per cent in 1967-68 compared to the previous year. Therefore the coke cost per ton of pig iron did not reduce but increased a little from about Rs. 59 in 1966-67 to Rs. 60 in 1967-68. The coke cost constitutes about 20 per cent of the total works cost and about 50 per cent of the total cost of raw materials as can be seen from Table No. 24.

The cost of electric power per ton of pig iron during 1966-67 and 1967-68 was Rs. 97 and Rs. 106 respectively.

The combined cost of electricity and coke per ton of pig iron will therefore be still very much higher in the electric pig iron furnace, compared to the coke based blast furnace. It is interesting to note that in Japan, the coke rate per ton of hot metal is almost half that of blast furnaces in India and almost equal to the coke rate in electric furnaces.

The consumption of different grades of coke at MISL per ton of pig iron was 237 kg., 36 kg. and 32 kg. of coke, coke breeze and charcoal breeze respectively. The rate per ton of coke increased from Rs. 145 in 1966-67 to Rs. 160 in 1967-68. The rate per ton of coke breeze also increased from Rs. 61 in 1966-67 to Rs. 91 in 1967-68. The rate for charcoal breeze did not increase but remained at Rs. 15 per ton.

The requirement of coke according to the anticipated production flow sheet given by MISL is 94,700 tons. The quantity of coke received during each year from

1962-63 and the railway freight per ton were as follows :

COST OF COKE

Year	Coke received in tons	Railway freight paid (Rs. in lakhs)	Average Railway freight per ton Rs. Ps.
1962—63 ..	56,096	23.23	41.40
1963—64 ..	47,516	20.66	43.47
1964—65 ..	14,362	6.52	45.43
1965—66 ..	39,451	20.84	52.83
1966—67 ..	27,156	16.04	59.06
1967—68 ..	32,675	21.10	64.56

From these figures, it will be seen that the railway freight per ton increased by more than 50 per cent from Rs. 41 in 1962-63 to Rs. 64 in 1967-68. The railway freight alone constituted about 47 per cent of the total cost of coke in 1967-68. There is scope to reduce the coke rate and power consumption per ton of pig iron by proper sizing, screening and grading of the materials used in the charge to improve the furnace efficiency. Installation of cooling towers may also help to improve the working of the transformers. The feasibility of some pre-heating and pre-reduction of charge may also be examined.

Electricity. 8.4. As has been already emphasised, electricity is a crucial in-put and constitutes approximately 30 per cent of the total works cost excluding excise duty, depreciation, overheads and financial charges. Obviously the economics of electricity based iron and steel units depends largely on the power rate. The cost of electric power at MISL has increased in the last few years as indicated in Table No. 25. These are the actual cost per unit of power as given by MISL and are higher than the minimum tariff rates for various reasons such as shutdowns, fluctuations in power supply and utilisation. For instance, the amount payable to the Mysore State Electricity Board (MSEB) is calculated on the maximum Kva demand recorded, though the actual utilisation may fall below this. Therefore, in order to keep the actual price per

unit of power consumed as close as possible to the minimum tariff rate, it is absolutely essential that the Mysore State Electricity Board ensures that there are no frequent shutdowns and fluctuations in power supply which affects not only the actual rate of power but also control over the quality of the products. The consumption of power at MISL is about 2700 Kwh per ton of pig iron. Any loss in production due to failure and fluctuations of power supply by the Mysore State Electricity Board should be carefully identified and should not be a burden on the financial position of MISL. There should be an automatic, agreed device or arrangement by which the cost of such lapses on the part of the MSEB is deducted from the total power charges payable by MISL. During our discussion at MISL, it was stated that the approximate loss due to breakdowns and power shut-downs was Rs. 45 lakhs during 1967-68. The quantity of power consumed for metallurgical purposes, increased from 245 million units in 1962-63 to 313 million units in 1964-65 (28 per cent) and to 344 million units in 1966-67 (10 per cent increase over the previous year). It again went down to 313 million units in 1967-68. The power bill increased from Rs. 67 lakhs in 1962-63 to Rs. 91 lakhs in 1963-64 (36 per cent) and Rs. 101 lakhs in 1964-65 (11 per cent). It was Rs. 121 lakhs for 1965-66 (20 per cent). 125.30 lakhs in 1966-67 (3 per cent) and 120.73 lakhs in 1967-68. From these figures, it will be seen that the increase in the power bill between 1962-63 and 1966-67 was about 90 per cent even though the quantity consumed increased by only 40 per cent. Though in the years 1964-65 and 1967-68 the quantity of power consumed was the same, *viz.*, 313 million units, the power bill in 1967-68 was Rs. 121 lakhs as compared to Rs. 101 lakhs in 1964-65. These figures indicate that the increase in the power bill was due to both increase in the rate of electricity tariff and inefficient supply and utilisation of power. Both MSEB and MISL should make a realistic assessment of these factors and make an earnest effort to improve the efficiencies of power supply and utilisation. Recently it has been announced that the surcharge of 15 per cent is also applicable to MISL. This surcharge will further increase the power bill and affect the economic working of the industry. In the case of metal-

lurgical and power intensive industries, *ad-hoc* increases in the power rate without fully considering its financial implications and impact on their working cost is likely to seriously affect the stability and growth of this industry. With regard to the instability of power supply and its effects on the operating efficiency of the furnaces at MISL, late Shri K. Mallappa in a communication, dated 20th December, 1963 when he was Minister for Industries & Commerce and Chairman of MISL stated as follows: "There are frequent shutdowns and restrictions, resulting in loss of production to a considerable extent. On some occasions, power restrictions and interruptions have had undesirable and deleterious effects on the metallurgical furnaces on which heavy investments have been made. Requests made to the State Electricity Board to take a sympathetic view of the problem so that such restrictions and interruptions are reduced at least to the minimum, if they cannot be eliminated altogether, have not been heeded to. Therefore the matters have been placed before the Chief Minister for kindly taking action to remove the difficulties experienced by the Company".

Limestone, quartz and manganese.

8.5. Limestone is used as a flux to remove impurities from the charge through the slag. Silica and other gangue associated with the ore and the ash content of the coke have to be induced to combine with the fluxes and removed in the form of slag. Limestone is normally used for this purpose and has to be of good quality. In 1967-68, the limestone cost worked out to about Rs. 7.5 per ton of pig iron which amounted to about 6 per cent of the total cost of raw materials excluding electricity. The limestone quarries are located at Bhadigund, 14 miles from Bhadravati and limestone is transported to MISL in hopper wagons by the narrow gauge railway line. The cost per ton of limestone is also increasing; the rate in 1967-68 was Rs. 15.54 per ton as compared to Rs. 12.58 in the previous year, amounting to an increase of about 23 per cent. The total limestone requirement is estimated by MISL at 94,400 tons of which about 59,400 tons will be required for the two new 24,000 Kva electric pig iron furnaces which are under construction. The present requirement of limestone is only about 35,000 tons.

Small quantities of quartz and manganese ore also form part of the raw materials. But the cost incidence of these two commodities which amounts to a little more than a rupee a ton is less than 1 per cent of the total cost of raw materials. Manganese ore is also used as a desulphurising agent.

8.6. Scrap is a basic raw material for steel making. The proportion of scrap that can be used in the open hearth furnaces, L.D. converters, and electric arc furnaces are not the same. According to the figures given by MISL and reproduced in Table No. 15 the two open hearth furnaces will require 18,000 tons of hot metal (pig iron), 32,800 tons of scrap and 1,200 tons of alloys to produce 35,000 tons of mild steel. The two 12-ton L.D. converters are estimated to require 70,000 tons of hot metal, 23,000 tons of scrap and 5,000 tons of alloys to produce 70,000 tons of special steels. The two 20-ton electric arc furnaces and one 8-ton electric arc furnace are estimated to require 8,000 tons of hot metal, 71,700 tons of scrap and 6,400 tons of alloys, in order to produce 60,000 tons of special steels. It is also stated that the two similar electric arc furnaces of 6-ton and 3½-ton capacities will require 1,000 tons of hot metal, 13,700 tons of scrap and 800 tons of alloys in order to produce 11,000 tons of mild steel. The total requirement of scrap is estimated at 1,41,200 tons, while the scrap generated in the plant itself is about 36,000 tons. The balance of more than one lakh tons of scrap will have to be purchased. At MISL, the anticipated ratio of scrap to pig iron in the open hearth is as high 2 : 1 as compared to 2 : 3 in other steel plants. The anticipated percentage of scrap to hot metal in the L.D. converters is 33 at MISL as compared to 10 to 15 in other steel plants. It will be seen that the electric arc furnaces depend mainly on scrap and the value of scrap is very much lower than the cost of hot metal. Proper arrangements should be made for the efficient purchase of quality scrap on a steady and reliable basis. Proper grading and optimum utilisation of available and purchased scrap assumes great importance in the context of full conversion of MISL into an alloy and special steels plant. The quality and cost of the final product will depend on the quality and cost of scrap and other materials. Scrap.

Water.

8.7. The consumption of filtered water increased from 575 million gallons in 1962-63 to 1143 million gallons in 1967-68. However, the cost of this water increased from Rs. 2.29 lakhs in 1962-63 to Rs. 7.20 lakhs in 1967-68 as can be seen from the figures given below :

Year	*Quantity in million gallons*	*Value (Rs. in lakhs)*
1962—63	575	2.29
1963—64	787	3.06
1964—65	825	3.61
1965—66	927	5.54
1966—67	1,128	6.19
1967—68	1,143	7.20

In other words, while the consumption of filtered water doubled during these years, the value increased by more than three times. As regards raw water, the consumption remained more or less the same, but the value increased from 2.88 lakhs in 1962-63 to Rs. 3.53 lakhs in 1967-68. The total cost of water doubled during this period from Rs. 5.17 lakhs in 1962-63 to Rs. 10.73 lakhs in 1967-68. The raw water requirements of MISL are drawn from the Bhadra river.

CHAPTER IX

Manpower and Management

Salaries and wages.

9.1. When the Indian steel capacity was initially planned, it was generally expected that steel production in this country will have the advantage of relatively lower costs including salaries and wages compared to the major steel producing countries in the world, thereby enabling production both for the home market and exports. In the last few years, the level of salaries and wages in India have also risen along with other costs and prices in the country thereby reducing the initial relative advantage in costs of production. The incidence of salaries and wages on total costs depends, in different steel plants, on their size, technology and level of wage rates. Therefore manpower and wages in different countries can only be very broadly compared on the basis of total production per man year and wages as a proportion of total expenditure.

In the year 1964-65, taking only the number employed in the works, the output per man year was 59 ingot tons of steel at Bhilai and 69 ingot tons at Durgapur. The corresponding figures for Rourkela, TISCO and IISCO were 68, 68 and 65 tons per man year respectively. For MISL however the production of steel ingot per man year was as low as 21 tons for the year 1964-65. In the year 1964-65 MISL produced 48,000 tons of ingot steel and employed 9,497 persons, of which 2,300 were employed in steel making. Departmentwise break up of the 9,497 persons employed at MISL is given in Table No. 26. The percentage of persons employed in the works to total number of persons employed also shows variations from plant to plant. This depends on the proportion of construction labour and other factors such as the units like fertiliser and cement plants not related to steel making.

The total number of persons employed as compared to total sales and wages during the years 1963-68 is given in Table No. 27. From these figures it will be seen that the number of persons employed at MISL has not varied significantly in the last few years.

The total wage bill has gone up from Rs. 1.49 crores in 1963-64 to Rs. 2.31 crores in 1967-68 though the total number of persons employed in 1963-64 (10,035) was more than the persons employed in 1967-68 (9,347). This clearly indicates that the level of wages has approximately doubled during this period. Of course the costs and general level of prices have also increased considerably in recent years. Wages as percentage of total income decreased from about 16 per cent in 1963-64 to 15 per cent in 1966-67 and 1967-68. During 1967-68 wages and salaries of Rs. 2.43 crores at MISL constituted 15 per cent of the total expenditure of Rs. 15.08 crores including excise duty, interest and depreciation and 21 per cent of total expenditure excluding excise duty, interest and depreciation. In 1965-66 the total income of MISL increased by 24 per cent over the previous year's income while wages increased by about 21 per cent, as a result of the implementation of the Wage Board Award.

Productivity and profitability however depend on so many inter-related factors that it is very difficult to determine how much of it depends on the efficiency and effort of the labour and how much on the management, and several other factors affecting the steel industry as a whole. As stated by the Mahatab Committee on the cost of production of steel, " Costs on personnel whether on overall basis or departmentwise can be compared if there is comparability also in respect of equipment and technology, product-mix, hours of work, extent of work done through outside agency such as contractors or extent of purchases of parts including power, the state of maintenance of the equipment, the rate at which the plants are worked in comparison to their capacities, depending on their demand factors, etc. If all these factors are taken into account, no two plants can be considered sufficiently alike to allow comparison of productivity on an absolute basis ".

This committee of the Government of India has also stated that productivity in terms of annual ingot production in tons per employee, ranges from 55 to 72 tons (and the labour cost variation is between Rs. 43 and Rs. 57 per ingot ton) in India as compared to much

higher tonnages in some of the major steel producing countries of the world. During our discussions with Shri P. L. Tandon, Chairman, State Trading Corporation of India, it was indicated to our committee that broadly speaking the steel ingot production per man year was about 200 tons in Japan, 150 tons in U.S.A., and 100 tons in U.K. However, the Mahatab Committee based its estimates of man-power requirement on 100 ingot ton per man year in respect of the works departments. On the basis of 80 ingot tons per man year, the employment in the works for the year 1965-66 in the different steel plants including MISL are given in Table No. 28. For proper utilisation of man-power, standard manning and fuller utilisation of machinery are necessary. It has already been emphasised that such comparisons cannot be made on a realistic basis for units of different sizes with variations in technology and other conditions. The wage structure at MISL for different categories is given in Table No. 29.

Table No. 30 gives details regarding the direct labour costs and overhead charges and their percentages on the total costs excluding depreciation, financial charges and excise duty. From these figures it would be seen that the direct labour costs as a percentage of total cost excluding depreciation, financial charges and excise duty varied from 1.9 per cent to 12.5 per cent for different products manufactured at MISL. Similarly the percentages of overhead costs varied from 1.3 to 9.4 for different products. The total of these two items, *viz.*, direct labour charges and overheads as a percentage of total cost varied from about 10 to 16 per cent, except in the case of mild steel sections and special steels from the new rolling mills where the percentage was 4.6 and 2.3 respectively and in the case of special steel from old rolling mills (6.7 per cent). It may be of interest to note that the percentage of wages and salaries to total expenditure is 15 at MISL, about 14 at HSL, 21 at TISCO, 22 at IISCO and 15 to 18 in Japan, 35 to 45 in U.S.A. and 19 to 22 in Germany.

Incentive schemes.

9.2. The Estimates Committee, during its visit to the different steel plants, made it a point to look into the incentive schemes that had been introduced or were in the process of being introduced. Individual incentive

schemes, group incentive schemes and overall production bonus schemes are some of the different types of incentive schemes introduced in the industry. The main problem appeared to be the need to evolve a system of incentive wages which was (*a*) simple enough to be understood by the employees and the labour force and (*b*) scientifically related to the effort put in by individual employees or suitable groups of employees.

This implies that an effective and scientific system of incentive wages should be based on what might be described as a standard realistic effort for individuals or for different groups of workers for different types of operations. This obviously means that the total working of the plant is broken up into different homogeneous operations and realistic standard norms evolved for each of these operations on the basis of detailed time and motion studies and allowing for tolerances. On this basis standard manpower will have to be determined for different operations under conditions obtaining in our country. This will have to be a continuous process which takes into account technological improvements and changes in methods and conditions of work. Theoretically this would appear to be the most scientific approach to evolving a fair system of incentive wages. But in practice it is not free from difficulties. For instance, a truly accurate system will be quite complicated in practice and all groups of employees may not be able to realise its logic and relative fairness to the same extent. The process of fixing initial norms and altering them with changes in technology can prove to be difficult especially if the industrial relations in a particular unit are not very happy or peaceful. Inter-union rivalries can complicate matters very much and put a serious strain in labour management relations which ought to be at its best if a truly scientific and accurate system of incentive wages is to be worked with harmony and understanding. Moreover a system of incentive wages which is separately calculated for different groups of workers may sometimes get exposed to the charge that the efficiency of a particular group or groups of workers was affected by what happened in the other operational units of an integrated plant over which these particular groups

had no control. It is advisable that such incentive schemes are formulated in consultation with the representatives of workmen.

9.3. In the ultimate analysis, salaries and wages of employers will depend on the profitability of the unit or industry concerned, which in turn depends on various factors including productivity of labour, not only in terms of production, but in terms of the value of production which determines the capacity of the industry to pay. That is why it is very important that the steel plants in India are enabled to get a realistic level of prices so that they make profits if their physical productivity is better than a certain level which can be normally expected to be achieved under our conditions. If, for instance, the steel plants start making a profit as soon as their utilisation of plant and machinery exceeds the 80 to 85 per cent level, there will be a real incentive both on the part of management and labour to improve upon this level of production and productivity. Otherwise both labour and management will not be able to relate profits to efficiency and effort in a realistic and meaningful manner. In the large context of industrial relations, incentive schemes can work normally only on the assumption that the general level of prices in the country and the cost of living index is held within certain reasonable and bearable limits. Otherwise real wages can continue to fall even when monetary wages are increased and there is always a monetary limit to the capacity of the industry to pay. This basic fact of industrial relations casts a heavy responsibility on the national leaders and the representatives of the people who control the economic policies and political destinies of our country. The crux of the matter is to safeguard the real wages of the employee in order to ensure smooth industrial development. **Production.**

The International Labour Office at Geneva, writing on industrial productivity, has made some fundamental statements which are worth quoting here.

"The factors affecting the productivity of each organisation are many, and no one factor is independent of others. The importance to be given to the productivity of each of the resources—land, materials, machines

or men—depends on the enterprise, the industry and possibly the country.... In countries where capital and skill are short and unskilled labour plentiful and poorly paid, it is especially important that higher productivity should be looked for by increasing the output per machine or piece of plant or per skilled worker. It often pays to increase the number of unskilled workers if by doing so an expensive machine or a group of skilled craftsmen are enabled to increase their output. Most practical managers know this but many people have been misled into thinking of productivity exclusively as the productivity of labour, mainly because labour productivity usually forms the basis for published statistics on the subject". The problem of raising productivity should be treated as one of making the best possible use of all the available resources, and especially the materials and machines under our conditions.

The International Labour Office, Geneva, has also stated that "To achieve the greatest increases in productivity action must be taken by all sections of the community; Government, employers and workers. Government can create conditions favourable to the efforts of employers and workers to raise productivity. For this, it is necessary among other things :

(i) To have balanced programme of economic development.

(ii) To take steps to maintain employment.

(iii) To try to make opportunities for employment for those who are unemployed or underemployed and for any who may become redundant as a result of productivity improvement in individual plants.

This is especially important in underdeveloped countries where unemployment is a big problem".

Employers and workers also have a vital part to play. However, as stated by the International Labour Office "The main responsibility of raising productivity in an individual enterprise rests with the management. Only the management can carry out the productivity programme in each company. Only the management can

create good human relations and so obtain the co-operation of the workers which is essential for real success though this requires a goodwill of the workers too. Trade unions can actively encourage their members to give such co-operation when they are satisfied that the programme is in the interest of the workers as well as of the country as a whole ".

" One of the greatest difficulties in obtaining the active co-operation of the workers is the fear that raising productivity will lead to unemployment. Workers fear that they will work themselves out of their jobs. This fear is greatest when unemployment already exists and a worker who loses his job will find it hard to get another. Even in the economically developed countries, where employment has for years been at a very high level, this fear is very real to those who knew unemployment in the past."

Therefore the International Labour Office recommended that :

(i) There should be advance planning by employers of changes in industrial processes and equipment.

(ii) Where changes are planned which would make certain jobs redundant, consideration should be given to reducing or suspending new recruitment with a view to retaining redundant workers until sufficient jobs become available for them as a result of normal labour turn over.

(iii) Employers should give preference to displaced persons when filling vacancies in other departments, due account being taken for efficiency and good conduct and seniority.

(iv) Training and retraining courses should, where appropriate, be provided to enable workers to be transferred to other works.

(v) Measures should be taken through unemployment insurance schemes and in any other ways to protect the living standards of workers who might lose their jobs.

The International Labour Office concludes that "Even with written guarantees, steps taken to raise productivity will probably meet with resistance. This resistance can generally be reduced to a minimum if everybody concerned understands the nature of and the reason for each step taken and has some say in its implementation. Workers' representatives should be trained in the techniques of increasing productivity so that they will be able both to explain them to their fellow-workers and to use their knowledge to ensure that no steps are taken which are directly harmful to them. Many of the safeguards mentioned above can best be implemented through joint productivity committees and works councils".

Management.

9.4. Management has been described as the science and art of organisation and control of human activity directed towards specific ends. The systematic and scientific approach is at the root of all sound modern management. Because management deals with human beings, it can never be completely scientific, and must be regarded partly as an art. It implies leadership qualities and deep commitment to progressive, social purposes and national ends of which enlightened profitability is only a part, though a necessary one for the proper management of industrial enterprises.

The Administrative Reforms Commission in their report on public sector undertakings have stated that "The Government and the Planning Commission should evolve and lay down standard guidelines clearly for ascertaining national economic profitability" ....."Government should make a comprehensive and clear statement on the objectives and obligations of public undertakings. This statement should lay down the broad principles for determining the precise financial and economic obligations of the enterprises in matters such as creation of various reserves, the extent to which enterprises should undertake the responsibilities of self-financing, the anticipated returns on the capital employed, and the basis for working out rational wage structures and pricing policies".

In the case of public enterprises, there should be close consultation between the Government and the management of such enterprises, so that the management

undertakes certain clearly defined tasks and is responsible to achieve certain results on the basis of clear-cut assumptions. It should be possible to measure or assess the success achieved by the management with reference to norms and standards of performance and profits arrived at in consultation with them. This would commit the persons put incharge of such enterprises to show agreed results with reference to which their work could be judged. Such an approach will encourage responsible management and timely action. As a matter of fact, in a completely planned economy, there is a detailed arrangement by which the managers of public enterprises undertake clear-cut responsibilities to achieve specific results on the basis that raw materials and factors of production are made available in time at a certain cost and the entire planned production taken at an agreed price. If there are changes in these factors which are outside their control, the norms by which performance is judged are also suitably altered. Without some such arrangement there is a great danger of demoralising management of public enterprises by blaming them for factors outside their control and also by not clearly fixing the responsibility on them for factors within their control, resulting in both inefficiency and efficiency going undetected.

Planning and production control.

9.5. Modern management must adopt certain modern techniques and tools. For instance, at Bhilai and Rourkela, they have a well-equipped control room from which the General Superintendent keeps in close contact with the various operating units for effective control. Information from different sections and units of the Plant is being continuously received at the control room and instructions on the spot are conveyed to the persons concerned from the control room. As an integrated steel plant is a very complex and complicated system of closely inter-related units and operations, it is difficult to maintain effective control over the operations without such a control room. The cost of the equipment required for the control room is approximately Rs. 2 lakhs. The General Superintendent conducts a conference every morning with all the persons incharge of different units from the control room over the phone. Apart from this, the persons incharge of the control room are constantly recording

data and information which pours in from different units of the plant and the slightest dislocation is brought to the notice of the General Superintendent who issues instructions without delay and action taken is also closely followed from the control room. In this way, all particulars regarding shiftwise working is recorded in the log book and departmental production programmes are carefully planned in order to ensure that different production capacities are suitably matched and broken down to monthly, weekly and daily programme. MISL should also immediately think of having such a control room for effectively co-ordinating and controlling the working of the various productive units at Bhadravati. The Estimates Committee is of the view that there is considerable scope to improve management techniques and the manner of decision making at MISL.

Board of Directors.

9.6. In the public sector steel plants the General Manager is the number one Executive in-charge of the plant. He is also a member of the Board of Directors. At MISL the Managing Director is also the Vice-Chairman of the Board of Directors and presumably he is expected to function just like the General Manager of the public sector steel plant and be incharge of the day-to-day administration at Bhadravati. The Minister for Industries of the Mysore Government is the *ex-officio* Chairman of MISL presumably to ensure effective co-ordination between the Government and the industry. However, the Vice-Chairman and Managing Director is expected to effectively assist the Minister-Chairman who may not be in a position to devote much time to the business of the company due to his multifarious duties and responsibilities. The Vice-Chairman deputises for the Chairman during his absence and ensures continuity in decision making. Apart from the usual responsibilities at the Board level, the Vice-Chairman is expected to act as an effective link between the industry and the Governments both at Bangalore and Delhi. He should be mainly responsible for all those matters for which the Head Officer of the HSL is responsible, with regard to the steel plants under its management. The Vice-Chairman and Managing Director should ensure that adequate and timely financial and sales arrangements are made for the company by the Board of Directors. The day-to-

day running of the steel works at Bhadravati should be in charge of a Cheif Executive who should function like the General Superintendent in a public sector steel plant. He should be a technically qualified and experienced person responsible directly to the Vice-Chairman and Managing Director, who in turn should function like the General Manager in a public sector steel plant. These two top executives should form an effective team for the efficient management and working of the company, and be responsible to deliver the goods. There should be a deep sense of commitment and sufficient delegation of authority for quick decisions and effective implementation within the policy framework approved by the Board.

Before the product-mix at the plant is approved for the year the Board of Directors should make sure that these products can be sold at a remunerative price. At any rate, it should be a conscious decision at the Board level after taking into account all the factors involved, with reference to which the performance for the year could be judged. A lot of effective salesmanship and tying up of productive capacity at MISL with areas of remunerative demand in different parts of the country and for different end-uses will be needed if MISL is to function profitably. If some Governmental action at the State or Central level is required to help MISL to function profitably, it should be the prime responsibility of the Chairman, Vice-Chairman and Board of Directors to take adequate steps in this regard, well in advance, and take such decisions as the situation may demand so that responsibility for production and productivity does not get mixed-up with other factors such as price and policy which are outside the control of those who are in day-to-day charge of the productive units at MISL.

The Board of Directors should consist of experienced and qualified people who are in a position to devote sufficient time to their work. The Administrative Reforms Commission in their report on Public Undertakings have stated as follows with regard to the Board of Directors. "The Government representative should be selected on the basis of their qualifications and experience and not by virtue of the office which they

hold in a particular Ministry ..... Part-time members from outside the Government should be persons with proven ability in the fields of industrial, commercial or financial enterprise or in administration or in trade union organisation. These members should have faith in public enterprise and should not have such business or other interests as may affect their objec- of the Chairman or full-time members of the Board, ... The top management posts, like those of the Chairman or full-time members of the Board, should be filled by officers on deputation only when there is no suitable alternative available. As a general rule, Government servants selected for appointment to these posts should, on appointment thereto, opt out permanently for service in the public sector".

Technical collaboration.

9.7. A technical collaboration agreement was entered into with Messrs. Gebruder Bohler & Co. on 18th November, 1963 for a period of 10 years. Under this agreement, Bohlers have to advise MISL with regard to alloy and special steel, utilising equipment already in operation and under construction. A list of products on which they were to advise MISL is as follows:

I. Constructional steels such as:

(*a*) Unalloyed case hardening steels.

(*b*) Unalloyed steels for hardening and tempering.

(*c*) Alloyed (Manganese and Chromium Grades) case hardening steels.

(*d*) Alloyed (Manganese and Chromium Grades) steels for hardening and tempering.

(*e*) Spring steels.

(*f*) Ball and roller bearing steels.

II. Tool steels such as:

(*a*) Carbon tool steels.

(*b*) Cold work steels.

(*c*) Hot work steels.

(*d*) High speed steels.

III. Stainless steels:

(*a*) Chromium alloyed steels.

(*b*) Chromium nickel steels.

These products represent the range of production of Bohlers. Of these, the type of steels to be manufactured was to depend upon the available facilities and market conditions. The agreement did not include technical assistance on erection and equipment of the plant. Bohlers are not responsible for the setting up of the plant and various production facilities. They are only to give technical advice on production and impart on-the-job training.

Under the agreement, Bohlers are to be paid as follows:

(*a*) For production know-how: 2,250,000 U.S.$

(*b*) Protective rights: 50,000 U.S.$

(*c*) Planning for and advice on purchase of installations—100,000 U.S.

(*d*) Royalty at a rate of U.S.$ 3 per metric ton of finished saleable steel of acceptable quality. The total amount of royalty will be U.S.$ 1,950,000 based on a production of 650,000 metric tons in ten years. Should this production of 650,000 tons be exceeded within the ten years' period of the agreement, Bohlers shall be entitled to the same rate of royalty in respect of this additional production also, but subject to a limit of 20 per cent of the royalty sum of U.S.$. 1,950,000, *i.e.*, U.S.$ 390,000. Should the production of 650,000 tons not be reached by MISL within the period of ten years, the balance amount of the total royalty of U.S. $ 1,950,000 becomes payable in the last year of the contract.

According to this clause, a written statement fixing the date of starting of the production will be issued by Bohlers. Royalty will be payable within two months after every past half year. The Indian taxes and expenses in India are to be borne by MISL. MISL will submit to Bohlers a monthly statement of the steel

quantities produced, Bohlers will be entitled to verify this statement and production itself on the spot by an authorised delegate. All payments according to (*a*), (*b*), (*c*) and (*d*) will be made in U.S. Dollar or Pound Sterling at the exchange rate of the day. All banking and transfer expenses will be borne by MISL. The payments will be considered as effected when notified by Bohlers' bankers in Vienna. All costs of foreign technicians and training are to be borne by MISL. As a result of devaluation, the rupee equivalent of these payments has increased by 57½ per cent.

The agreement comes to an end in 1973. MISL's production of alloy and special steels from 1962-63 up to the end 1968-69 was about 49,000 tons which works out to an average annual production of 8,000 tons as against the licensed capacity of 77,000 tons per annum. Six years of this agreement are already over and the agreement puts full responsibility on MISL for implementation and use of such technical assistance as Bohlers are in a position to give.

Apart from technicians from Bohlers, technicians from Demag and AEG are also assisting MISL for various purposes. The number of foreign technicians at MISL from 1962-63 to 1968-69 and the payments made in respect of them are given in Table No. 31. It may be seen that the total payment made so far on this account is Rs. 1.86 crores, out of which Rs. 1.43 crores is towards salary and Rs. 0.43 crores towards living expenses of foreign technicians. This is apart from payments made to Bohlers for technical know-how which amounts to Rs. 1.22 crores, the details for which are given in Table No. 32. In other words about Rs. 3 crores have been spent so far on foreign technical know-how and technicians which works to an average of Rs. 50 lakhs per annum. The 14th Annual Report of Hindustan Steel Ltd. for 1967-68 states "During the year, manpower was increased from 98,330 to 105,355 to meet the requirements of the expansion units which were commissioned during this period. During the same period, the requirements of temporary and casual labour decreased from 19,042 to 12,627. Our dependence on foreign personnel also decreased and the number of foreigners

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on our pay rolls came down from 208 to 128 during 1967-68".

As against 128 foreigners working in all the four steel plants of HSL during 1967-68, there were 53 foreigners at MISL. Vigorous steps should be taken to reduce dependence on foreign technicians and maximise self-reliance as soon as possible. MISL should try to selectively harness the technical talent and experience available in the country before seeking foreign technical assistance for specific purposes. It must be realised that foreign technical assistance by the very nature of it is expensive and should be used sparingly. Every effort should be made to train young Indian technicians and attract persons with merit and experience.

Organisation.

9.8. At MISL, in view of the large variations between estimates of income and expenditure and actuals during the last three years (See Table No. 33) there is need to strengthen the finance wing. Annual reports should contain data in a readily intelligible form to enable quick and correct decisions and not obscure facts and trends which should be noticed in time. The company needs a new definition of its accountability. Answering questions in its operations especially when a crisis occurs is not real accountability. True accountability lies in an in-built system to assess, evaluate appraise and convey performance. An organisation must make a conscious effort to appraise and account for itself. There is need for all the executives in-charge of different departments to be responsible to one Chief Executive who should be responsible for the day-to-day working of the plant.

It is obvious that such a person incharge of the day-to-day working of the plant, however competent and experienced he may be, could deliver the goods only if he is ably assisted by competent executives. A recent review of the State Trading Corporation of India by a Government of India Committee headed by Shri Prakash Tandon, Chairman of State Trading Corporation stated as follows with regard to personnel policies :—

"A modern selection procedure should be adopted and the Corporation while encouraging talent

from within should at the same time take in fresh blood at managerial and specialist levels."

"The trend everywhere today in industry and administration is for the young to be the spearheads and the older ones to provide the support of advice and experience".

"If the Corporation is to have a future.....to select and to train its talent carefully and then to promote it by merit, where it clearly exceeds seniority, is essential".

"A personnel function is urgently needed to meet what is the major demand of any Corporation —a fair and progressive personnel policy, with well defined and objectively handled procedures that inspire confidence in recruitment, selection, confirmation, placement, training and promotion".

"The same care, and more, should be applied to the development of general staff as for management but this is only possible if a place is given to merit.....If the staff are willing to trust themselves and of course the management, to a system of merit, there would be no better means of self improvement".

These comments from the final report of the Committee to review the State Trading Corporation of India, are of particular relevance to the working of MISL, Bhadravati. Any Corporation or Company depends for its success upon its management, its system, its environment and its philosophy. Both a philosophy and a strategy are needed for a successful operational technology. In the words of the Committee on State Trading Corporation, any organisation "should concentrate on achievement rather than on public relations in the conventional sense. There is no public relations better than failings self-appraised and quickly corrected; and consistent achievement gently conveyed, without stridence, in a low key".

CHAPTER X

Summary and Conclusions

Introductory—purpose and scope of study.

10.1. The Mysore Iron and Steel Works, Bhadravati, was started in the beginning of this century to utilise the rich iron ore resources at Kemmangundi and the forest wealth at Bhadravati. Initially it consisted of a wood distillation plant and a small charcoal blast furnace with a capacity of 60 tons per day which went into production in 1923. (Chapter I—paras 1 and 2).

The Mysore Iron & Steel Works was expanded over the years and was converted into a limited company (MISL) in April 1962. It had the benefit of differential retention prices from 1949 to 1962. In the year 1967-68, it made a loss of Rs. 2.11 crores after capitalising interest of Rs. 1.20 crores. The total investment at MISL by the end of 1967-68 was Rs. 40 crores, financed by loans to the extent of Rs. 24 crores, the balance of Rs. 16 crores being Government share capital including Rs. 14 crores of the Mysore Government and Rs. 2 crores of the Government of India. (Chapter I—paras 2 and 3).

The Estimates Committee undertook this study in response to the concern expressed in the Mysore Legislative Assembly with regard to MISL, Bhadravati. The Estimates Committee also decided to visit other steel plants in the country, both in the public and private sectors, in order to make a comparative study and view the problems at MISL, Bhadravati, in the proper perspective and against the background of the steel industry as a whole. (Chapter I—paras 4 and 5).

The Alloy Steel Plant at Durgapur has a licensed capacity of 60,000 tons of alloy and special steels while MISL, Bhadravati, is in the process of converting itself from mild steel to alloy and special steel production with a licensed capacity of 77,000 tons. MISL has a bright future as an alloy steel plant provided swift and effective steps are taken to complete its conversion from mild steel to alloy steels and the management and working is made more dynamic and efficient. (Chapter I—para 15).

The Estimates Committee thanks the authorities of the steel plants it visited, for all their co-operation and hospitality. The discussions at Delhi with the concerned authorities, planners and experts were also very useful. The Committee thanks all those who were closely associated with this work and contributed to it in a dedicated manner. (Chapter I—paras 11, 12, 13 and 14).

Historical background and development.

10.2. The industry was originally the Mysore Wood Distillation & Iron Works. The wood distillation plant had a carbonising capacity of 200 tons of wood per day, and a small blast furnace was set up for utilising the charcoal. Some charcoal pig iron was exported to America; and a vertically cast pipe plant with an annual capacity of 10,000 tons was established in 1927 for the utilisation of pig iron locally. Dr. M. Visvesvaraya was the Dewan of Mysore from 1912 to 1918 and was in charge of the Bhadravati works for about six years from 1923. As coal was not available in this region, the industry was charcoal based. (Chapter II—para 1)

Two open hearth furnaces were commissioned in the year 1936 with a total capacity of 45,000 tons per annum, along with a rolling mill with a capacity of about 30,000 tons of finished steel. A strip and rod mill with a capacity of 13,000 tons was installed in 1942 and started operation in 1946. A $3\frac{1}{2}$-ton electric arc furnace was installed in 1941. A cement plant with a capacity of 60 tons per day was added in 1947. Two ferro-silicon furnaces of 1,500 Kva each, with a total production of about 2,000 tons per annum, were installed at Mysore in 1942 and later shifted to Bhadravati. (Chapter II—para 2).

The second phase of development at Bhadravati from about 1945 to 1955 consisted of:

(i) Two 13,200 Kva electric pig iron furnaces with a total annual production capacity of about 60,000 tons.

(ii) Two cement kilns with an additional annual production capacity of 60,000 tons (1952).

(iii) A 9,000 Kva ferro-silicon furnace with an annual production capacity of 5,000 tons (1950).

(iv) Acetic acid plant with 600 tons capacity.
(Chapter II—para 3).

Developments during the Second and Third Five-Year Plan periods may be considered the third stage of development at MISL. Only the spun pipe plant was completed during the Second Plan period. The programme of expanding the steel production capacity by 1,00,000 tons was completed at a total cost of Rs. 12 crores in 1965. Two 12-ton LD converters with a total capacity of 80,000 tons per annum, one 20-ton electric arc furnace with a capacity of 20,000 tons per annum and a new rolling mill with a capacity of about 80,000 tons of finished steel were commissioned in 1965. A second 20-ton arc furnace and a 8-ton arc furnace were commissioned in 1967 and 1968, respectively. The programme for production of 15,000 tons of stainless steel was not taken up. In 1962, two 12,000 Kva furnaces for the production of ferro-silicon were installed. (Chapter II—para 4).

In June 1962, Shri C. Subramaniam, Union Minister for Steel and Heavy Industries, suggested the conversion of MISL into an alloy steel plant. In September 1962, MISL proposed a Rs. 10 crore expansion programme (including two new 24,000 Kva electric pig iron furnances with an additional annual total capacity of 1,20,000 tons, estimated at only Rs. 1.5 crores). This was based on Demag's proposal of August 1962 which envisaged, in the third stage, a production of 75,000 tons of finished alloy and special steel (including 8,000 tons forging) and 36,000 tons of finished common steel. In Demag's first stage, the production of finished alloy and special steels and finished common steel was to be 42,000 tons and 38,000 tons, respectively. The industrial licence given to MISL on 20th December 1960 was for 77,000 tons of alloy and special steels. (Chapter II—paras 5, 6, 7 and 8).

From this survey of developments, it will be seen that the mild steel expansion programme planned in the Second Plan period was completed only by the end of the Third Plan period in 1965. The programme to convert MISL completely into an alloy steel plant was

thought of in 1962 but has still not been completed. Consistent planning and correct decisions are needed to complete the conversion of MISL into a full-fledged, viable alloy steel plant under the present conditions. (Chapter II—para 8).

Production and demand for steel.

10.3. MISL's growth has been based on the use of electricity and limited by its distance from coal fields unlike TISCO. MISL did not produce steel prior to 1936. Its production in 1938-39 was 23,000 tons. The percentage of imports to total steel consumed in India decreased from 86 in 1920-21 to 27 in 1938-39, mainly due to increase in TISCO's production from 1.2 to 7.1 lakh tons. In the post-war period, the average annual production of steel in the country was 9,35,000 tons during 1945-50 and 1.14 million tons during 1950-55. The average consumption during these two five year periods of 1945-50 and 1950-55 was 1.11 million tons and 1.43 million tons, respectively, and average imports as a percentage of average consumption was 17 and 21 respectively. During the subsequent two five-year periods of 1955-60 and 1960-65, the average steel consumption increased to 2.74 million tons and 4.84 million tons, respectively. Average imports as a percentage of average consumption increased to 46 in 1955-60 and was 23 in 1960-65. The three public sector steel plants at Rourkela, Bhilai and Durgapur went into production in 1959-60. MISL's programme of expanding mild steel production capacity by 1 lakh tons was completed only in 1965 after the differential prices had been abolished in 1962 and the period of acute shortages was coming to an end. (Chapter III—paras 2 and 3).

The Second Five-Year Plan target for steel production was 6 million tons. For the Third Five-Year Plan, the target was 18 million tons which was later reduced to 10 million tons. However for 1967-68, the production of ingot and saleable steel in the country was 6.2 million tons and 4.6 million tons, respectively, and the capital investment in the integrated public sector steel plants including the alloy steel plant at Durgapur was about Rs. 1,100 crores. (Chapter III—paras and 5).

To strengthen MISL's relationship with the steel industry, it is suggested that a high power team includ-

ing the General Manager of Alloy Steel Plant, Durgapur and some senior executives from HSL and other steel plants, the Planning Commission, the Ministry of Iron and Steel of the Government of India and some independent technical consultants should be invited to visit MISL, Bhadravati, for an on the spot study and exchange of views in order to fully explore the manner in which MISL could profitably function by concentrating on those areas in which it may have a special advantage. Similarly, a high power team from MISL should visit the Alloy Steel Plant, Durgapur and other steel plants in order to further strengthen the bonds of technical and economic relationship. MISL should have a long-term relationship with HSL so that each takes into account the programmes of the other in planning for the future. The production, planning and sales policy of MISL and the Alloy Steel Plant (ASP), Durgapur should be complementary and mutually beneficial. Such a co-operative approach is very essential. There should be a forum at which all the public sector plants including ASP, Durgapur and MISL, Bhadravati can discuss and decide regarding the products each plant is best suited to produce and how they could share the demand in the home market and abroad without unnecessary duplication and uneconomic production. The capacities and production programmes of TISCO & IISCO could also be taken into account. MISL should have an arrangement with HSL by which the Central Engineering and Designs Bureau (CEDB) has a branch office at Bhadravati (Chapter III—para 6 and Chapter VI—para 11).

According to the estimates and long-term projections made by the National Council of Applied Economic Research (NCAER), by the end-use method, the total domestic demand for finished steel, foundry grade pig iron, alloy and special steels and ferro-alloys is expected to be as follows :

	In million tons				
	Mild steel		*Foundry grade pig iron*	*Alloy & spl. steels (rolled)*	*Ferro-alloys*
	Ingots	*Finished steel*			
1970—71 ..	9.55	7.1[illegible]	1.79	0.38	0.17
1975—76 ..	14.10	10.51	2.39	0.58	0.24
1980—81 ..	20.50	15.[illegible]7	3.48	0.87	0.34

The Steering Group on Iron and Steel of the Ministry of Steel and Heavy Engineering, Government of India, in its report of February 1969, concluded that due to decline in domestic consumption of steel from 5.36 million tons in 1964-65 to 4.032 million tons in 1967-68, the NCAER targets for 1970-71 and 1975-76 would be achieved by only 1973-74 and 1978-79, respectively. The estimated domestic demand for finished steel at the end of the 4th and 5th Plans, *i.e.*, 1973-74 and 1978-79 was put at 7.12 million and 10.97 million tons, respectively. (Chapter III—para 7).

On the basis of existing capacities, the availability of finished steel and pig iron in 1973-74 was estimated by the Steering Group at 6.34 million tons and 1.14 million tons, respectively. The gap between this availability and domestic demand plus planned exports was estimated at 2 million tons of finished steel in 1973-74 and half a million ton after taking into account Bokaro's stage I, 6th blast furnace at Bhilai, IISCO's expansion and other technological improvements. It estimated the gap to be of the order of 3 million tons in 1978-79. The Steering Group expects that a portion of this gap would be met by the installation of electric furnace *cum* continuous casting plants to the extent of 0.25 million tons by 1973-74 and 0.35 million tons by 1978-79. The total production of steel from electric furnaces in India is about 2.5 per cent of the total production as compared to about 20 per cent in most of the developed countries. India has surplus scrap and is currently exporting scrap to the extent of about half a million ton per annum to Japan. The Government of India should take policy decisions on the lines suggested by the Steering Group to make electricity based steel production viable. With this object in view, adequate protection should be given to electricity based iron and steel production. This is of special interest to Mysore State in view of its electricity and iron ore resources. In view of the gestation period of 5 to 7 years, the need to plan the commencement of one or two new integrated steel plants is indicated. The claims of the Sandur—Hospet region for a new integrated steel plant should be stressed by the Mysore Government to the Government of India and the Planning Commission. (Chapter III—paras 7, 8 and 9).

As regards the demand and supply of pig iron, the NCAER estimates an apparent gap of 2 lakh tons in 1975-76 assuming that Bokaro is in full production. Almost all the licences issued for the production of foundry grade pig iron in the private sector amounting to about 7 lakh tons per annum have not materialised. However, in the Bellary District of Mysore State, a 15,000 Kva electric reduction furnace of the Sandur Manganese and Iron Ores Limited has commenced production from 18th September, 1968 and has an annual capacity of about 40,000 tons . The two new electric pig iron furnaces of 24,000 Kva each under construction at MISL, have a total annual capacit ' 1,20,000 tons and are expected to go into prodi 'y about 1970-71. The Steering Group on I. .l Steel of the Government of India recommended that " Electro-Metallurgical industries should be treated on a special footing with regard to electricity tariffs ". (Chapter III—paras 10 and 11).

Alloy and special steel plants should be enabled to fully meet the requirements in the country. If, in the meanwhile, the larger steel plants are allowed to produce special steels, care should be taken to ensure that this does not in any way affect production, profitability and sales of alloy and special steels by the smaller units. (Chapter III—para 12).

The foreign exchange earned by MISL by exports during 1964-65, 1965-66. 1966-67 and 1967-68 were Rs. 45 lakhs, Rs. 53 lakhs, Rs. 50 lakhs and Rs. 96 lakhs, respectively. Ferro-silicon is its traditional item of export. The installed capacity of ferro-silicon at MISL is 20,000 tons and the exports of ferro-silicon were 4,800 tons in 1964-65, 5,500 tons in 1965-66, about 2,400 tons in 1966-67 and 2,500 tons in 1967-68. The proposed additional ferro-silicon capacity at MISL is 15,000 tons. The cost of this proposed production is bound to be higher than that of the old unit. Before embarking on this project, care will have to be taken to ensure that this production is exported at a remunerative price. (Chapter III—para 13).

Alloy and special steels, ferro-alloys and pig iron.

10.4. Alloy and special steels will be increasingly required to meet the demand of engineering industries. The main raw materials required for making alloy steels are pedigree steel scrap, ferro-alloys, refractories, fluxes, graphite electrode and heavy electrical energy. The Indian Standards Institute has evolved six different standards for alloy and special steels as follows :

Alloy steels :

(*a*) High carbon, high speed alloy tool and die steels.

(*b*) Spring steels.

(*c*) Alloy constructional steels.

(*d*) Stainless and heat-resisting steels.

Special steels :

(e) Free cutting and low alloy steels.

(*f*) Electrical steel sheets (silicon steels).

(Chapter IV—para 1).

By the end-use method, the demand for alloy and special steels by 1970-71 and 1975-76 has been estimated by NCAER at about 380,000 tons and 570,500 tons, respectively. Of this estimated demand, alloy steels constitute 60 per cent and special steels 40 per cent. The Steering Group of the Ministry of Steel and Heavy Engineering estimated the demand for alloy and special steels at 162,000 tons in 1969-70, 294,000 tons in 1973-74 and 430,000 tons in 1978-79. The Steering Group estimated a gap or shortfall in supply of about 65,000 tons of alloy and special steels in 1973-74 and 200,000 tons in 1978-79 mainly in the category of low alloy constructional steel. (Chapter IV—paras 3 and 4).

The following production capacities are either installed or under implementation :—

	Tons
Alloy Steel Plant, Durgapur ..	60,000
MISL, Bhadravati ..	77,000
GKW, Calcutta ..	42,000
Mahindra Ugines & Co. ..	36,000
Globe Industries ..	6,000
Canara Works ..	9,600
Total ..	2,30,600

(Chapter IV—para 5)

Apart from this, it was proposed to license additional capacity of 1,26,800 tons. This would increase the total licensed capacity to 3,50,000 tons against an estimated demand of less than 3 lakh tons at the end of 1973-74. It is suggested by the Steering Group that the ingot capacity at Alloy Steel Plant, Durgapur be stepped up by 2,00,000 tons by 1977-78 by installation of additional electric furnaces. Even after taking into account, the addition of 2,00,000 tons of ingots at Alloy Steel Plant, Durgapur by 1977-78, it would still leave a gap of 1,15,000 tons of steel ingots or about 70,000 tons of finished steel according to the report of the Steering Group. In other words, even on the basis of the conservative demand estimates made by the Steering Group and assuming full utilisation of the Durgapur Alloy Steel Plant's rolling capacity, there is still scope for other units in the field to contribute to increase in capacities. (Chapter IV—paras 5 and 7).

MISL, Bhadravati should make a determined effort to ensure that it does not lag behind by quickly and fully utilising its present licensed capacity and also improving upon it, particularly with regard to quality. On the basis of the present licensed capacities, MISL is the biggest alloy and special steel unit in the country. Even from the point of view of the regional distribution of the industry, it is important to ensure that MISL fully retains its natural importance in the total alloy and special steel production in the country. The present licensed capacity at MISL for special and alloy steels is 77,000 tons. The production during 1969-70 is expected to be about 45,000 tons. There is an increasing demand for stainless steel for making utensils, furniture, chemical bearing metals, pump sets, etc. MISL should give detailed thought to this as stainless steel is a part of its industrial licence. (Chapter IV—paras 5, 7 and 8).

Pig iron for production of iron castings in foundries is referred to as pig iron for sale as distinct from pig iron utilised within the plant for ingot steel. The demand for grey iron castings constitutes about 95 per cent of the demand for iron castings, the balance being malleable iron castings, ductile alloy castings and cast iron spun pipes which require superior quality pig iron which can be best produced in electric pig iron

have to be increased by Rs. 75. In other words, the notional capital block would have to be Rs. 1,800 per ton instead of Rs. 1,176. If 85 per cent utilisation of capacity is to be the break-even point, the steel prices would have to be increased by about Rs. 50, *i.e.*, the notional capital block would have to be Rs. 1,600. MISL is outside the scope of the JPC prices, as it is not considered a major steel producer. However, if steel prices are fixed in a realistic manner, the financial position of MISL would also indirectly improve. In the steel prices, at present, there is a built-in subsidy to the consumers of steel. As against a loss of Rs. 40 crores, HSL paid an excise duty of Rs. 32 crores in 1967-68. (Chapter V—paras 3, 4 and 5).

The Indian Tariff Board, 1949 in its report on the fair retention prices of steel produced by Mysore Iron and Steel Works, Bhadravati, had recommended differential retention price of Rs. 331 per ton as compared to Rs. 226 per ton for TISCO, a difference of about 50 per cent. The Tariff Board justified differential retention prices on the ground that the costs of the two units differed owing to the fact that they were unequal in size, equipment, financial resources and technical experience. However, an uniform sale or issue price for steel was fixed to consumers. The JPC operates a freight equalisation fund so that steel could be sold at an uniform level at all rail heads. The steel equalisation fund was wound up with effect from 1st March 1964. (Chapter V—paras 6 and 7).

The engineering industry needs a wide variety of steels especially alloy and special steels. However, the demand for different types of high alloy steels is small and specialised. It would be very helpful if a certain amount of standardisation could be introduced in the demand for alloy and special steels. Sooner or later, it may become necessary for the producers of alloy and special steels to come together informally to evolve prices for alloy and special steels in their mutual interest and with a view to effectively cater to the demand. (Chapter V—para 8).

10.6. MISL are pioneers in electric pig iron production in India. Their pig iron capacity will

Production and productivity.

increase from 85,500 tons to 2,05,500 tons after the two new 24,000 Kva electric pig iron furnaces go into production in 1970-71, and more than a lakh of tons will have to be sold to foundries. In 1967-68, MISL's pig iron production amounted to just 1 per cent of the total pig iron production in India. However, the pig iron sold to foundries by MISL in 1967-68 amounted to 24 per cent of its own production of pig iron and 1.5 per cent of the total sale of pig iron to foundries in the country. Electric pig iron is superior in quality to blast furnace pig iron. However, the works cost of electric pig iron is approximately double that of blast furnace pig iron because it is power intensive and can be produced only in comparatively small units. (Chapter VI—paras 1, 2 and 3).

The mild steel ingot production of MISL in 1967-68 was 82,000 tons which was 1.3 per cent of the All India production of 6.25 million tons. The percentage of semis to total saleable mild steel production of MISL during 1967-68 was as high as 49. The working of the MISL so far indicates that it has no special advantage for the production of mild steel. That is why, a complete conversion of MISL to an alloy steel plant was suggested by Shri C. Subramaniam, the Union Minister for Steel and Heavy Engineering, in 1962. Out of the total steel ingot capacity of 1,86,000 tons at MISL, 61,000 tons is the capacity of the electric arc furnaces (33 per cent), 80,000 tons of the two 12-ton LD coverters and 45,000 tons of the two 25-ton open hearth furnaces. (Chapter VI—paras 4 and 5).

Electric arc furnaces are ideally suited for the production of alloy and special steels. MISL produced 7,789 tons of saleable alloy and special steel in 1967-68 as against 7,000 tons by the Alloy Steel Plant, Durgapur. MISL's production of alloy and special steel ingots in the years 1966-67, 1967-68 and 1968-69 were 12,225 tons, 9,775 tons and 23,244 tons respectively amounting to 16.2 per cent, 10.6 per cent and 24.2 per cent of its total steel ingot production during these years. (Chapter VI—para 5).

MISL should be able to produce alloy and special steels profitably provided the arc furnaces are worked to rated capacity. The MISL has now found that it is much cheaper to use scrap in the electric arc furnaces instead of pre-blown hot metal from the LD converters, called duplexing, the cost of which is prohibitive. Both the cost and quality control of producing alloy and special steels in arc furnaces from good quality scrap will be better and more attractive compared to production of special steels from LD converters. (Chapter VI—para 6).

A technical committee including independent experts should immediately examine and report to Government regarding the feasibility or otherwise of utilising LD converters economically. MISL's conversion from mild steel to alloy and special steels was originally based on the idea of duplexing. Now that the duplexing process has to be discarded on grounds of cost, what is to happen to the LD converters should be immediately determined. Moreover, the oxygen plant has not been working satisfactorily and the LD converters were worked at only 27 per cent and 50 per cent of their rated capacity during 1967-68 and 1968-69, respectively. Even the electric arc furnaces were worked far below their rated capacity. (Chapter VI—paras 6 and 8).

Pig iron requirement for internal utilisation is about 25,000 tons without the LD converters and about 1,00,000 tons with the LD converters as against the existing pig iron capacity of 85,000 tons, apart from 1,20,000 tons capacity of the two new 24,000 Kva furnaces being installed. The present iron ore production at Kemmangundi mines is about 88,000 tons and sinter about 55,000 tons. When the two new 24,000 Kva electric furnaces go into production, the additional requirement of iron ore and sinter would be about 1.38 lakh tons and 60,000 tons, respectively. The modernisation and mechanisation of the mines and the doubling of its transport capacity for this purpose will need a capital outlay of about Rs. 8 to 10 crores which has not been provided for. It is unrealistic to meet the iron ore requirement of the increased pig iron production by purchase of ore. (Chapter VI—para 10).

The forging facilities contemplated by MISL for about 17,000 tons of alloy and special steels is likely to cost another Rs. 8 to 10 crores if it is to be properly equipped. If it is found that the licensed capacity of 77,000 tons of alloy and special steels is best produced from electric arc furnaces and not LD converters, it would be necessary to add one or two 50-ton arc furnaces or if feasible, one 100 ton electric arc furnace with suitable modifications to the rolling and finishing facilities at MISL. This may cost another Rs. 15 to 20 crores. A comprehensive project report and realistic estimates of total capital requirement should be drawn up, and the Planning Commission and the Government of India should be fully informed so that these items get adequate priority in the context of national planning. Finances will have to come mainly from the Government of India and financial institutions in view of the limited resources of the State Government. Under estimation of capital requirements may result in unnecessary waste and avoidable financial losses. Details regarding production and performance of different units at MISL with critical comments are given in Table No. 13. This clearly indicates that the working of MISL has been far from satisfactory and there is considerable scope for improving both the efficiency and the management techniques. The Committee views with concern this state of affairs and suggests that effective steps are taken to set right the situation. The anticipated production flow sheet as envisaged by MISL is given in Table No. 15. (Chapter VI—paras 11 and 12 and Chapter VII—para 7).

Financial aspects.

10.7. An analysis of the Balance Sheet and Profit and Loss Account of MISL shows that it made a loss of Rs. 2.11 crores in 1967-68 after capitalising interest to the extent of Rs. 1.20 crores. For the year 1968-69, the loss was Rs. 3.06 crores after capitalising expenditure of Rs. 1.29 crores. The total interest capitalised during 6 years ending 1967-68 was about Rs. 3.85 crores, and the expenditure on trial operations capitalised was Rs. 98 lakhs. Before capitalising interest and after calculating full depreciation, the loss for 1965-66 and 1966-67 would have been Rs. 69 lakhs and Rs. 141 lakhs instead of profits of Rs. 52 lakhs and Rs. 44 lakhs, respectively. (Chapter VII—para 1).

An analysis of the cost of production shows that interest charges of MISL constituted 12.3 per cent of its total cost for the year 1967-68, as compared to 8.6 per cent of HSL, 3.2 per cent of IISCO and 2.2 per cent of TISCO. MISL's expenditure on wages and salaries was 15 per cent of its total expenditure as compared to 14 per cent, 21 per cent and 22 per cent for HSL, TISCO and IISCO, respectively. The cost of raw materials, power and fuel amounted to 38.5 per cent of total expenditure for MISL as compared to 23.9 per cent for IISCO, 27.7 per cent for TISCO, and 26.2 per cent for HSL. These costs are highest for MISL mainly because it is an electricity based plant where cost of power and fuel alone works out to 24.3 per cent of total expenditure. (Chapter VII—para 2).

An analysis of the profitability of different products in 1967-68 shows that only the ferro-silicon plant made a distinct profit of about Rs. 56 lakhs. The pig iron production for sale to foundries made a marginal profit of Rs. 6.7 lakhs after adjusting stocks. All other items made a loss. Mild steel billets alone resulted in a loss of Rs. 1.20 crores and special steels also incurred a loss of about Rs. 16 lakhs. (Chapter VII—para 3).

During 1967-68, MISL obtained unsecured loans of Rs. 12.97 crores including Rs. 8.75 crores from Government of India and Rs. 3.17 crores from German Bank (KFW). This together with the depreciation for the year of Rs. 1.46 crores, was utilised towards addition to fixed assets and capital works in progress of Rs. 8.44 crores, reduction in secured loans of Rs. 3.95 crores and loss of Rs. 2.11 crores. The loan from Government of Mysore and dues by MISL to Mysore Government towards interest, supplies and services aggregating Rs. 10.18 crores were converted into share capital deposit during 1967-68. (Chapter VII—para 5).

The debt-equity ratio for MISL was 4.3:1 in 1965-66, 5:1 in 1966-67 and 2:1 in 1967-68 as compared to 0.98:1 for HSL, 0.90:1 for TISCO and 1.37:1 for IISCO in 1967-68. The debt-equity ratio is normally expected to be 1:1. MISL should request the Government of India to convert its loan into equity capital. If Central Government's loan of Rs. 11 crores as on 31st

March 1968, is converted into equity, the share capital of MISL will become Rs. 27 crores as against a loan of Rs. 20 crores. Consequentially, Government of India may want to participate more actively in the management of MISL. (Chapter VII—para 6).

The MISL estimated the capital cost of its conversion programme to alloy and special steels at Rs. 36.35 crores of which Rs. 23.04 crores were spent by March 1968, and another Rs. 6.58 crores during 1968-69, leaving a balance of Rs. 6.73 crores. This is an underestimation of MISL's capital requirements. As already pointed out, forging and other finishing facilities will require about Rs. 8 to 10 crores; mechanisation and increasing transport facilities at the mines to become self-sufficient in iron ore and sinter by 1970-71 will need another Rs. 8 to 10 crores; and finally, doubling the electric arc furnace capacity, if that becomes necessary, can easily cost an additional Rs. 15 to 20 crores. This additional capital requirement of Rs. 35 to 40 crores does not include the capital requirement of the proposed expansion of ferro-silicon production capacity which according to MISL will be done largely from a foreign loan which is being negotiated and which is proposed to be re-paid by the export of this ferro-silicon. Taking into account about Rs. 30 crores already spent on the conversion programme, this would mean a total outlay of Rs. 65 to 75 crores. Excluding Rs. 10 crores for mechanising the mines to meet the requirements of the increased pig iron production, it would be Rs. 55 to 65 crores which is not unrealistic considering that alloy and special steel plants do need an investment of about Rs. 6,500 per ton of ingot production capacity. This outlay has to be intelligently and effectively phased over a reasonable period by suitable dovetailing of priorities. Conversion to alloy steels should receive the highest priority. Production which results in loss should be avoided. Such a realistic approach would be less painful in the long run than merely continuing production on the old basis. There is scope at MISL to improve not only utilisation of capacity but the value of the product-mix which is what counts from the point of view of financial viability and strength. The future development of MISL should be taken up

on the basis of an integrated project report which takes into account all factors and carefully dovetails investments and profitability. (Chapter VII—para 7).

Raw materials.

10.8. The raw material cost excluding power and fuel constituted about 14 per cent of the total expenditure and 38 per cent including power and fuel at MISL for the year 1967-68. Transportation charges at MISL are as high as 40 per cent of the total cost of the raw materials, iron ore, sinter, coke, quartz and manganese as compared to 15 to 19 per cent at the integrated steel plants. As MISL's production is electricity based, its consumption of coke per ton was about 525 kg. per ton of pig iron in 1965-66 as compared to 800 to 940 kg. per ton in the coke-based blast furnaces of the integrated steel plants, and 400 to 450 kg. per ton in the Japanese blast furnaces. However, the total cost of coke and electric power per ton of pig iron is about Rs. 100 more at MISL compared to the integrated steel plants. (Chapter VIII—para 1).

Good quality iron ore with Fe content of more than 60 per cent is available in Mysore State. After the two new 24,000 kva. electric furnaces go into production in 1970-71, about 4,00,000 tons of iron ore including about 1.04 lakh tons of fines (to produce 80,000 tons of sinter) will have to be mined. Every ton of iron ore mined results in about 0.26 ton of fines ; and 1.3 tons of fines gives 1 ton of sinter. The bulk of this requirement of about 4 lakh tons will have to be mined by MISL. No steel works can afford to depend largely on the purchase of ore. The proposal for the mechanisation of the mine prepared by the NMDC, at the request of the MISL, has been under consideration since 1966. The capacity of the crushing and screening plant and the internal transport system will have to be doubled. The cost of Rs. 6.25 crores estimated by MISL appears to be low. (Chapter VII—para 2).

There is scope to reduce the coke rate and power consumption per ton of pig iron if proper sizing, screening and grading of the raw materials is done. Electricity is a crucial input and constitutes approximately 30 per cent of the total works cost of MISL excluding excise duty, overheads, depreciation and financial

charges. Consumption of power at MISL is about 2,700 Kwh. per ton of pig iron. The actual cost per unit of power is higher than the minimum tariff rates for reasons such as shut-downs, fluctuations in power supply and utilisation. Loss in production due to power failures and fluctuations on account of MSEB should be carefully identified and not become a burden on the financial position of MISL. There should be an agreed automatic arrangement to deduct the cost of such power failures and fluctuations from the power charges payable by MISL to MSEB. The recent surcharge of 15 per cent on the power rate should not be made applicable to MISL as it will only further worsen its position. Such ad-hoc increase in power rate will seriously affect the stability and growth of electro-metallurgical industries. (Chapter VIII—paras 3 and

Lime stone is used as a flux. The present and future requirement of lime stone is 35,000 tons and 94,400 tons, respectively. The lime stone quarries are located at Bhadigund, 14 miles from Bhadravati. Small quantities of quartz and manganese ore also form part of the raw materials. Manganese ore is also used as a desulphurising agent. (Chapter VIII—para 5).

The total requirement of scrap is estimated at 1,41,000 tons while the scrap generated in the plant is about 36,000 tons. The balance of more than 1 lakh tons of scrap per annum will have to be purchased. According to the anticipated flow sheet of MISL, the ratio of scrap to pig iron is 1:3 for the LD converters. 2:1 for the open hearth and the electric arc furnaces depend mainly on scrap. (Chapter VIII—para 6).

Manpower and management.

10.9. For the year 1964-65, the steel ingot production per man year was as low as 21 tons at MISL as compared to 59 tons at Bhilai, 65 tons at IISCO, 68 tons at TISCO and Rourkela and 69 tons at the Durgapur Steel Plant. It was about 100 tons in U.K., 150 tons in U.S.A. and 200 tons in Japan. In 1964-65, MISL produced 48,000 tons of ingot steel and employed 9,497 persons of which 2,300 were directly employed in steel making. For proper utilisation of manpower, standard manning and fuller utilisation of machinery

are necessary. The total wage bill at MISL has gone up from Rs. 1.49 crores in 1963-64 to Rs. 2.31 crores in 1967-68. The level of wages has approximately doubled during this period. The cost and general level of prices have also increased. During 1967-68, wages and salaries constituted 15 per cent of the total expenditure of Rs. 15.08 crores as compared to 14 per cent in HSL, 21 per cent in TISCO, 22 per cent in IISCO, 15 to 18 per cent in Japan, 19 to 22 per cent in Germany and 35 to 45 per cent in U.S.A. (Chapter IX—para 1).

The Estimates Committee made it a point to study the system of incentive wages. The main difficulty appeared to be to have a system which is simple enough to be understood by all and scientific enough to accurately relate quantum of effort to incentives earned. Incentive wages will have to be based on the concept of standard manning which takes into account standard effort for different types of operations. The process of fixing initial norms and altering them with changes in technology can be easier if the industrial relations are happy and there are no inter-union rivalries. (Chapter IX—para 2).

From the point of view of capacity to pay, productivity depends not only on physical production but also on the value of production. The steel industry ought to get a realistic price so that both labour and management will be able to relate profits to efficiency and effort in a realistic and meaningful manner. The productivity of an organisation depends on many interrelated factors. But, as pointed out by the International Labour Office, Geneva, "The main responsibility of raising productivity rests with management". The Government also has a major responsibility in maintaining the general level of prices within reasonable limits and having a balanced programme of economic development with adequate employment opportunities. (Chapter IX—para 3).

Management implies good leadership qualities and deep commitment to progressive, social purposes and national ends of which enlightened profitability is only a part, though a necessary one for the proper management of industrial enterprises. The Administrative

Reforms Commission have said that the Government and the Planning Commission should evolve and lay down standard guide-lines clearly for ascertaining national economic profitability. The Government should make a comprehensive and clear statement on the objectives and obligations of public undertakings. It should be possible to measure or assess the success achieved by the management with reference to standards and norms of productivity and profitability arrived at in consultation with them. Otherwise, there is the possibility of demoralising management of public enterprises by blaming them for factors outside their control and also by not clearly fixing the responsibility on them for factors within their control, resulting in both inefficiency and efficiency going undetected. (Chapter IX—para 4).

There is considerable scope to improve management techniques and the manner of decision making at MISL, Bhadravati. MISL should have a well equipped control room to maintain effective control and co-ordination over the operation of the plant as in other steel plants. (Chapter IX—para 5).

The Minister incharge of industries is the *ex-officio* Chairman of MISL. The Vice-Chairman and Managing Director is expected to effectively assist the Minister-Chairman and ensure continuity in decision making. Apart from the usual responsibilities at the Board level, the Vice-Chairman and Managing Director is expected to act as an effective link between the industry and the Government and ensure that adequate and timely financial and sales arrangements are made for the company by the Board of Directors. The day-to-day running of the steel works at Bhadravati should be in charge of a Chief Executive who should function like the General Superintendent in a public sector steel plant. He should be a technically qualified and experienced person, responsible directly to the Vice-Chairman and Managing Director, who in turn will function like the General Manager in a public sector steel plant. These two top executives should form an effective team for the efficient management and working of the company and be responsible to deliver the goods. There should be a deep sense of

commitment and sufficient delegation of authority for quick decisions and effective implementation within the policy frame work approved by the Board. Before the production programme and product-mix is approved, the Board of Directors should make sure that these products can be sold at a remunerative price. The Board of Directors should consist of experienced and qualified persons who are in a position to devote sufficient time to their work. (Chapter IX—para 6).

A technical collaboration agreement was entered into with M/s. Bohler & Co., of Austria on 18th November 1963 for a period of ten years. Technicians from Demag and AEG are also assisting MISL for various purposes. About Rs. 3 crores have been spent so far on foreign technical know-how and technicians in the last six years which works out to an average of Rs. 50 lakhs per annum. In the year 1967-68, there were 53 foreign technicians at MISL as compared to 128 in all the four HSL plants together. Vigorous steps should be taken to reduce dependence on foreign technicians and maximise self-reliance. Every effort should be made to attract competent technicians with merit and experience. (Chapter IX—para 7)

Regarding organisational matters and personnel policy, the Review Committee on the State Trading Corporation has stated as follows, which is of relevance to MISL.

"A fair and progressive personnel policy with well defined and objectively handled procedures that inspire confidence in recruitment, selection, confirmation, placement, training and promotion is very essential".

"If the staff are willing to trust themselves and of course the management, to a system of merit, there would be no better means of self-improvement".

"Any organisation should concentrate on achievement rather than on public relations in the conventional sense. There is no public relations better than failings self-appraised and quickly corrected; and consistent achievement gently conveyed, without stridence, in a low key". (Chapter IX—para 8).

APPENDIX I

DETAILS OF THE STUDY TOUR PROGRAMME OF THE ESTIMATES COMMITTEE.

16—6—1969	Departure Bangalore for Bhilai *via* Nagpur.
17—6—1969	Arrival at Bhilai.
18—6—1969	Visit to Bhilai Steel Plant.
19—6—1969	Discussions with the General Manager and senior executives of Bhilai Steel Plant. Departure for Rourkela by train.
20—6—1969	Arrival at Rourkela and visit to the Rourkela Steel Plant.
21—6—1969	Discussions with the General Manager and senior executives of Rourkela Steel Plant. Departure for Durgapur *via* Calcutta.
22—6—1969	Arrival at Durgapur.
23—6—1969	Visit to Indian Iron and Steel Co., Burnpur.
24—6—1969	Visit to Alloy Steel Plant, Durgapur and discussions with the General Manager and senior executives.
25—6—1969	Visit to Durgapur Steel Plant and discussions with the General Manager and senior executives.
26—6—1969	Departure Durgapur for Jamshedpur.
27—6—1969	Visit to Ranchi and Heavy Engineering Corporation. Discussion with the Chairman and senior executives of Hindustan Steel Limited.
28—6—1969	Visit to National Metallurgical Laboratory and Jadugoda Uranium Plant.
29—6—1969	Visit to Ferro Manganese Plant, Joda.

30—6—1969	Visit to TELCO Works and the Tata Iron and Steel Company (TISCO). Discussions with the Directors and senior executives of TISCO.
1—7—1969	Arrival at Calcutta from Jamshedpur. Departure for Delhi.
2—7—1969 to 4—7—1969	Meetings and discussions at Delhi.
5—7—1969	Departure Delhi for Bangalore.

APPENDIX II

Data and Points for Discussion and Study by the Estimates Committee

1. Rated capacity and actual production during the past six years including 1968-69 in respect of (i) Pig Iron, (ii) Steel Ingots and (iii) Saleable Steel. The percentage of rated capacity achieved may be shown in each case and in each year and rated capacity clearly defined with reference to technical norms. Break up of saleable steel production, productwise giving percentage of the production of each item to total production of saleable steel.

2. Operating expenses for the last six years including 1968-69. The operating expenses may be classified under the following categories (i) Raw materials, (ii) Payments to employees, (iii) Power and Fuel, (iv) Stores and Spares (v) Maintenance and Repairs, (vi) Insurance, (vii) Interest (viii) Excise Duties, (ix) Freight, (x) Other Miscellaneous and (xi) Depreciation. Such an analysis of the operating expenses may be made for the Plant as a whole and for each of the three following stages of production separately *viz.*, (i) Pig Iron or Hot Metal, (ii) Steel Ingot and (iii) Finished Steel. The nature and extent of the overheads to be clearly analysed in a separate note and indicated as a separate item under the category 'Other Miscellaneous'. The category 'Payments to Employees' should include all direct wages and salaries of persons working in the Steel Plant. Further break-up and particulars of each of the categories of expenditure mentioned above will be welcome.

3. Summary of Balance Sheets and Profit and Loss Accounts for the past six years 1963-64 to 1968-69 in the form given below.

SUMMARY OF BALANCE SHEET AS AT .....

WHAT THE COMPANY OWNED :

1. Fixed Assets—Gross Block excluding work-in-progress.

   Less Depreciation.
   NET BLOCK

2. Works-in-progress.

3. Investments (Including Security Deposits from contractors and others).

4. Net current assets (excess of stock, stores, debtors, advances and cash balance over current liabilities for supplies, services etc.)

5. Intangible assets (deferred revenue expenses, preliminary expenses and stamp duty, etc., not yet written off).

Total assets.

What the Company owed :—

1. Borrowings from Bank.

2. Loan from Government of India.

Total liabilities.

Net Worth—Share holders' Equity (Excess of what the Company owned over what the Company owed).

Represented by :—

1. Share Capital.

2. Share Deposit.

3. Net Loss.

SUMMARY OF PROFIT AND LOSS ACCOUNT FOR THE YEAR ENDED.....
EXPENDITURE.

Raw Materials.
Salaries and Wages.
Stores and Spares.
Maintenance and Repairs.
Freight Outward.
Excise Duty.
Insurance.
Others.
DEPRECIATION.
INTEREST ON LOAN.

Less :

Transfer to Capital—D.R.E. and other Accounts.
Accretion/Decretion to Closing Stock.

Income :

Sale of products.

Other miscellaneous income.

Net Profit (+) Loss (—).

With regard to Transfer to Capital and other accounts, the nature of such outlays and reasons for transfer to capital account should be clearly indicated.

4. The annual and progressive totals of Capital expenditure for the years 1962-63 to 1968-69 may be given along with break-up of share capital, loan capital and foreign exchange raised in each of these years.

5. Analysis of sales productwise for the years 1962-63 to 1968-69. The products could be grouped under the following categories; Pig Iron; Ingots; Blooms; Slabs; Billets; Sleeper Bars; Structurals; Merchant products; Axle and Wheel sets; Wide and Heavy Plates; Wire Rods; Rails and Fish Plates; Sleepers; Wheels; H. R. Coils; Sheets and Narrow Plates; CR Coils and Sheets; Pipes; Tin Plates; Quantity and value of these categories of products for each of the year may be shown for purpose of comparison indicating also percentage of the category to the total (both for quantity and value).

6. Sectorwise analysis of despatches under the following categories: (i) Railways, (ii) Defence, (iii) Other Government indentors, (iv) Private Industries and (v) Stockists. These figures may be analysed for the last two years giving not only total quantities despatched to different sectors but also the break-up productwise as per categories in the productwise analysis of sales. The idea is to know what are the quantities of different products consumed in different sectors.

7. Figures of exports categorywise and countrywise for six years.

8. Break-up of working capital for the past 6 years showing figures in respect of stock-in-trade and stores and spares.

9. Comparison of capital block with typical capital block of equivalent modern equipment. We would like to compare the capital cost of different steel plants in India with the capital cost of steel plants of similar capacity in some foreign countries such as U.K., U.S.A., U.S.S.R., Germany and Japan.

10. Comparative analysis of depreciation rates in India with those of steel plants in foreign countries and their incidence on total costs.

11. Comparison of incidence of interest charges in India and abroad.

12. Increase in cost of raw materials during the last 6 years particularly in respect of coal, iron ore and limestone.

13. Increase in labour charges in terms of wage per manday and productivity. A detailed analysis of productivity of labour, the variations, comparisons with norms in foreign countries and scope to improve it under Indian conditions. Impact of shutdown, strikes, etc., and the direct and indirect consequences on production. Self-reliance in respect of technical personnel.

14. Selling price of billets compared to cost of production. Steel pricing structure and the effect of underutilisation of capacity on earnings. A detailed note on the logic of price structure and price mechanism in relation to profitability would be very welcome. Subsidies for exports. Comparison between our export price and international export prices both FOB and CIF. Financial implications of subsidy on exports as compared to domestic sales.

15. Diversification—need for greater resilience in production planning. A detailed note on this subject will be very helpful.

16. Technological improvement—Analysis of the need for sustained programme of investment in terms of balancing facilities, additions and technological improvements. What are the norms by which the profitability of these investments could be judged ?

17. To what extent does price reduction increase demand ? In other words what is the elasticity of demand for different steel products in the country.

18. Strategy of exports—What are the items which have the best chance of withstanding international competition and why ?

19. The scope, administrative and technological, for cost reduction—Facilities such as oxygen injection in steel melting shops, sinter plants, etc.

20. To what extent is any fall in production during recent years due to fall in demand and how far is it due to inability to attain rated production for various other reasons.

APPENDIX III

Case for Steel Plant in Sandur—Hospet Region

BY

M. Y. GHORPADE

The Perspective Planning Division of the Planning Commission, in its 'Material and Financial Balances' published in September 1966, estimated the final demand for finished steel as 4.4 million tonnes in 1964-65, 8.4 million tonnes in 1970-71 and 16.4 million tonnes in 1975-76.

The Government of India's consultants, M. N. Dastur & Co. Private Ltd., in their report of January 1964, indicated that even after taking into account the Bokaro, there will be an all-India shortfall of about 4 million tonnes of steel ingots in 1970-71 and about 11 million tonnes in 1975-76. The States of Mysore, Maharashtra and Kerala are expected to have a deficit of about 3.8 million tonnes of steel ingots in 1970-71 and 7.4 million tonnes in 1975-76.

Feasibility

The Mysore Government Memorandum or feasibility report of February 1965 on the location of the fifth integrated steel plant estimated the country's shortfall in steel sheets and plates at 1.37 and 1.38 million tonnes respectively by 1970-71. It emphasized the "acute shortage" of these steel "flats" and estimated 75 per cent of this shortfall with reference to South Indian demand; so 1.5 million tonnes of ingot steel was to produce 0.70 million tonnes of hot rolled sheets and 0.35 million tonnes of light and medium plates. Costs of the proposed steel plant in Sandur-Hospet region were worked out on this basis.

The Mysore Report also referred to the "serious dearth of pig iron for foundries, hampering the growth of engineering industries in the region". It stated that "with abundant electric power available in the Mysore State, after commissioning of the Sharavati hydro-electric Project, the economics and advantages of electric pig iron furnaces and similar processes also deserve consideration",

One such 15,000 KVA electric furnace for the production of 40,000 tonnes of foundry grade pig iron per annum is being installed at Vyasankere, at one end of the Sandur range of hills, near the Tungabhadra Reservoir, and will go into production early next year. This electro-metallurgical project in the private sector could also produce the ferro-manganese required by the public sector steel plant, when it comes into existence, as mentioned in the Dastur Report to the Government of India on a large integrated steel plant in this region.

The Dastur Report, submitted a year before the Mysore Memorandum, clearly brought out the locational advantages of a steel plant in this region. In their own words, "it contains rich deposits of iron ore and fluxes, and has direct access to the large industrial centre of Bombay and to the growing areas of Poona, Bangalore, Coimbatore, etc."

Dispersal

"A steel works located here would be in line with the policy of wider dispersal of capacity to utilise local resources and would give further impetus to industrial development in the western and southern regions. Also it would help to rationalise the rail transportation of steel supplies, which would otherwise have to be moved over large distances from the eastern plants". It envisaged an initial capacity of 1.5 million tonnes to permit the adoption of optimum-sized blast furnaces and L.D. converters, while making provision in the initial layout for expansion of the plant to 4 million tonnes. The emphasis on "optimum size" should not be missed.

The setting up of two or three below optimum size plants in different States, for political reasons, as suggested in some quarters, will only create great difficulties in the future apart from being technically unsound. A steel plant should be able to utilise the economies of scale to the maximum extent possible in order to keep costs within workable limits and safeguard its future competitive position.

Even the nationalised British steel industry is seriously considering ways of introducing competition between different units, in cost, service, quality and productivity if not in the price, and provide optimum conditions for realising economies of scale. It has been reported that Britain's nationalised steel production will be based on decentralised management to foster

internal competition to reduce costs and promote exports. We in India, cannot escape the compulsions of technology.

Japan is the third biggest steel producer in the world, but has to import more than half her requirement of coking coal and more than three-fourths of her requirement of high grade iron ore for the purpose. We, in Bellary district, are sitting on one of the richest iron ore deposits in the world. The iron content in the ores of the Sandur–Hospet region, ranges from 60 to 68 per cent.

It is hard, lumpy ore and with very low impurities like phosphorus and sulphur. Three to four million tonnes of steel ingots will need only 6 to 8 million tonnes of iron ore per annum, *i.e.*, 300 to 400 million tonnes over a period of fifty years. It is also proposed to step up the export of these rich ores to Japan. For this purpose, Donamalai deposits near Taranagari in Sandur taluk are to be developed in a big way.

Sandur Belt

At present, workings of mostly float ore are confined to the eastern slopes of the Sandur belt which are favourably situated to the railhead. Mechanisation, bulk handling and transportation will have to be introduced and the ports will have to cope with it. Export of three to four million tonnes per annum to Japan will amount to 150 to 200 million tonnes over a period of 50 years. The Mysore Government has estimated the iron ore 'proved' reserves in this region to be of the order of 1,000 million tonnes.

Recently, the National Mineral Development Corporation also undertook intensive surveying work in this area to determine ore reserves. To be extremely conservative, even if ore reserves are assumed at half that figure there is enough excellent iron ore in this region to justify both a big steel plant and a big export programme.

It is reported that West Germany and Japan are willing to help in the speedy development of Karwar port in return for iron ore from this area. An amount per ton of iron ore export could be adjusted towards repayment of the foreign investment

over a number of years. This will ensure steady long term demand for our export commodity and need not adversely affect the producer in the post-devaluation situation.

Moreover, modernisation of a port, mainly for this purpose will reduce port-handling and loading charges and sea freight significantly. The Japanese genius for producing things at a competitive price is well known. Why should not both Karwar port development and a steel plant in Bellary district be planned with German or Japanese collaboration? If it pays Japan to take our iron ore for steel making to Japan, it should also pay to produce steel where the ore is found.

Such long term collaboration is not beyond the genius of Japan and India. It could be so planned that the foreign investment gets repaid in diversified products, intelligently produced to meet the requirement of a developing market, so that port and the plant generate their own repayment capacity and do not become a financial burden.

But this presupposes, faith, all round, in the political and ethical climate in the country and in our will and capacity to honour long term pledges and promises. In this sense, even purely technical and commercial matters are not independent of politics.

Dasturs estimated the capital cost of the proposed steel plant at about Rs. 340 crores including a foreign exchange component of Rs. 120 crores, *i.e.*, about 36 per cent of plant cost. These cost figures are based on 1963 prices.

The Mysore Memorandum or report of 1965 estimated the capital cost of the plant at Rs. 302 crores excluding "possible deferred payment charges, interest on loans, etc." It also estimated the cost per ton of steel ingot at (i) Rs. 244 with 50 per cent imported coal and 50 per cent Kanhan coal; (ii) Rs. 249 with 100 per cent imported coal and (iii) Rs.252 with 50 per cent imported coal and 50 per cent Jharia coal. It did not work out the costs with 50 per cent Kanhan and 50 per cent Jharia coal which was the cheapest according to Dasturs (Rs. 226).

The costs for finished steel plates were calculated at Rs. 351, Rs. 356 and Rs. 359 for the above three alternatives

respectively. The Dastur figures for cost of steel plates were Rs. 342 based on 50 per cent Jharia and 50 per cent Kanhan coal; Rs. 349 with 50 per cent imported and 50 per cent Kanhan coal and Rs. 363 with 100 per cent imported coal. It is strange that the Mysore report mentions "the non-availability of the reports of the Government of India consultants for reference" in preparing its own report or Memorandum "to serve as an aid memoire to the consortium".

Cost Estimate

While the Dastur report was confined to the question of a steel plant in the Hospet–Goa region, the Mysore Memorandum went a step further and calculated that the highest costs for Hospet under the above alternatives were lower than the lowest costs for Vishakapatnam (Rs. 367 with 50 per cent imported and 50 per cent Kanhan coal) and for Goa (Rs. 363 with 100 per cent imported coal).

Then came the report of the Anglo-American consortium. According to an official summary of the consortium's report, Vishakapatnam was considered the best among the deep water sites and Hospet as the best of the inland sites.

It is interesting to note that the consortium appears to have expressed a preference for Vishakapatnam as a deep water plant "although raw material importation is not contemplated at present for the Fifth plant" as admitted by the consortium. (We have already seen that 100 per cent importation of coal is not the lowest cost basis even for Vizag).

The consortium stated that Vizag will obviate the need to transport heavy and bulky plant equipment inland. The capital cost on such factors as transport and mining equipment, etc., was supposed to be more by the grand figures of Rs. 11 crores at Hospet (Rs. 25 crores) compared to Vizag (Rs. 14 crores). Even assuming that this was true, what is Rs. 11 crores in a project of more than Rs. 300 crores? Is this such a heavy price to pay for the long term advantages of locating a plant in the heart of both the ore reserves and the indigenous market for steel?

The Mysore Memorandum however stated that "the capital cost of equipment will be practically the same for all locations". It is utimately a question of locating a steel plant

right in the centre of the process of South Indian industrialisation. In a way, this consideration in favour of an inland site is even more fundamental than the crucial fact that the cost of production will be the lowest in the Sandur-Hospet region compared to any other known site in South India.

The Dastur Report of the Consultants of the Government of India as well as the Mysore report clearly indicated that a site near Toranagalu railway station (between Bellary and Hospet in Sandur taluk) is the best for locating the steel plant.

Carrying Ore

The Mysore report clearly stated its preference for the Toranagalu site as the ore can be brought to the plant site direct by ropeway and the "Daroji tank can be used as reservoir for storing required quantities of water near the plant" from the high level canal.

Power is available from Sharavathi and flux grade limestone and refractory grade dolomite are available in plenty in the Bagalkot-Bijapur area. There are rich limestone deposits in Hosadurga as well.

Thus, it is very clear that the Sandur-Hospet region has not only a cast-iron case, as the idiom goes, but an excellent steel case for the location of a 1.5 million tonnes plant with scope to expand to 4 million tonnes.

Temporary difficulties of finding the funds cannot rob this region of its birth right and the country of its long term prospects. Sooner or later this land of iron and manganese must, inevitably, fulfil its natural destiny. But we must take bold and imaginative steps now. That is our sacred obligation to this land.

APPENDIX IV

Basis of Estimates of Steel Demand by National Council of Applied Economic Research (NCAER)

The NCAER study states : " Given the consumption level for finished steel and the extent of manufacturing and construction activities, it is possible to derive within close limits the demand for (a) Castings and therefore foundry grade pig iron and also the demand for (b) Alloy and Special Steels." The NCAER has stated that the estimates of mild steel consumption by the end-use method have been compared with alternative methods of projection at least at the macro levels, if not in detail for different types and categories of steel. Their demand estimate, by end-use method, of 7.5 and 10.5 million tons ingot steel in 1970-71 and 1975-76 respectively, more or less corresponds with estimates arrived at on the basis of other methods such as (a) regression on industrial output, (b) regression on national income, (c) multiple regression on industrial output and construction. However, the linear trend gives a lower figure and non-linear trend a higher figure. But considering the fact that apparent consumption of steel in 1965-66 was about 5 million tons, the estimate of about 7 million tons demand in 1970-71 seems fairly realistic.

These estimates are based on the assumption that the overall investment for the period 1966-67 to 1970-71 would be of the order of Rs. 13,550 crores and between 1970-71 and 1975-76 Rs. 25,200 crores. The National Income at the end of these two Five Year periods, is expected to be Rs. 19,660 and Rs. 24.190 crores respectively giving a cumulative rate of growth of 2.1 per cent in the period 1966-67 to 1970-71 and 4.2 per cent in the period 1970-71 to 1975-76. The growth rate is 3.1 per cent after 1964-65. The NCAER study states " that the growth in the agricultural sector would be about 2.5 per cent cumulative from 1967-68 onwards and that the growth in the industries sector would be about 7.8 per cent. The combined effect of these two is an overall growth rate of 2.1 per cent upto 1970-71 and 4 per cent beyond 1970-71 ". If the growth rate during the period 1970-71 to 1975-76 is stepped up from 4.2 to 5 per cent or 6 per cent then the corresponding demand for finished steel is expected to go up from 10.5 million tons to 10.9 million tons if the growth rate is 5 per cent and

11.4 million tons if the growth rate is 6 per cent. The estimated demand of 15.375 million tons of finished steel in 1980-81 assumes a growth rate of 5 per cent between 1975-76 and 1980-81. This demand is estimated to go up to 18.8 million tons if the growth rate during this period could be stepped up from 5 to 7.5 per cent.

It is interesting to note that the NCAER in an earlier study made in 1960 had estimated the finished steel demand at 7.2 million tons in 1965-66 on the basis of planned investment of Rs. 13,000 crores during the Third Five-Year Plan. The estimated domestic demand of 7.125 million tons for 1970-71 made in the recent study of NCAER is based on the anticipated investment of Rs. 13,550 crores between 1966-67 and 1970-71. As stated in the study "The State of Development anticipated earlier for 1965-66 is, in effect, being shifted by five years to 1970-71. The fact is that while the Third Plan document had envisaged the national income to reach Rs. 19,000 crores (at 1960-61 prices) by 1965-66, in this study, we expect that level to be achieved only by 1970-71". The Ministry of Iron and Steel also estimated in 1967 that the demand for finished steel in 1970-71 will be 7.2 million tons. In 1963, M/s. M. N. Dastur & Co. had estimated the demand for finished steel to reach 8.7 million tons by 1965-66, and U.S. steel had estimated at 6.9 million tons by 1965-66.

The NCAER study further states that at the overall level the available capacity upto 1970-71 is just short of the anticipated demand as shown below:—

Anticipated demand.—7.125 million tons (Finished steel).

Future capacity.—6.841 million tons.

Apparent gap.—0.284 million tons.

The figures for supply of steel upto 1970-71 relate only to the established capacities of the main producers, secondary producers and re-rollers as at present. The NCAER study states that "the capacity of MISL is omitted because this unit, although producing some mild steel now, is to be switched over completely to alloy steel production after all the new production facilities are established." It also does not take into account the anticipated output from Bokaro and additional output from IISCO as a result of their plans of expansion from 1 million tons to 1.3 million tons of ingot steel and also the Bhilai expansion from 2.5 million tons to 3.2 million tons.

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TABLE No. 1.

List of production units at Mysore Iron and Steel Limited with year of installation, capacity and book value as on 31st March, 1968

Particulars	*Year of installation*	*Capacity in tonnes*	*Book value as on 31st March 1968*
			(Rs. in lakhs)
Pig Iron Units :			
1. Blast furnace	1923	24,500	19.49—
2. Electric pig iron furnaces—I & II ..	1952	61,000	39.30
Semi Finished Steel Units :			
3. Open hearth	1936	45,000	26.27
4. Electric Arc Furnace 3½ ton ..	1941	5,000	0.62
5. — do — 6 tons ..	1965	7,000	9.74
6. 20-tonne electric arc furnace-I ..	1965	20,000	132.37
7. 20-tonne electric arc furnace-II ..	1967	20,000	121.14
8. L.D. Plant	1965	80,000	322.61
9. Oxygen plant	1965	9.216 million cubic metres	82.89
Finished Steel Units :			
10. Rolling mills	1936	30,000	11.26
11. Strip and rod mill	1946	13,000	8.72
12. New rolling mills	1965	80,000	541.14
Foundry Units :			
13. Steel foundry	1962	2,500	42.30
14. General foundry	1923	6,000	21.20
15. Pipe foundry	1927	10,200	8.45
16. Cast iron spun pipe plant ..	1958	15,200	44.17
17. Plate sleeper foundry	1952	..	5.86
Ferro Alloy Units :			
18. Ferro alloy plant 1,500 KVA. ..	1942	20,000	9.43
19. Ferro silicon plant 9,000 KVA. ..	1950		11.38
20. New ferro silicon plant 12,000 KVA.	1962		104.84
Miscellaneous :			
21. Cement plant	1938	85,000	25.08
22. Sintering plant	1962	80,000	53.98

TABLE No. 2

Cost of conversion programme — MISL's estimate, actual expenditure and balance requirement

Items of expenditure	*Estimated Cost*	*Actuals upto end of March* 1968	*Amount spent during* 1968-69	*Total to end of* 1968-69	*Balance requirement*
	Rs.	Rs.	Rs.	Rs.	Rs.
1. Foreign Exchange Component					
Plant and equipment ..	15.27	11.52	1.03	12.55	2.72
2. Rupee Expenditure					
(*a*) Consultancy fees ..	1.69	1.32	0.15	1.47	0.22
(*b*) Interest and commitment charges ..	1.98	1.08	0.63	1.71	0.27
(*c*) Civil & Structural works	4.70	2.07	1.94	4.01	0.69
(*d*) Plant & Equipment	4.12	2.33	0.97	3.30	0.82
(*e*) Erection ..	1.85	0.53	0.69	1.22	0.63
(*f*) Customs duty ..	3.92	3.23	0.22	3.45	0.47
(*g*) Other expenses ..	0.78	0.07	0.07	0.14	0.64
(*h*) Interest	2.04	0.89	0.88	1.77	0.27
Total ..	36.35	23.04(1)	6.58	29.62	6.73

NOTE :—(1) This includes Rs. 1.21 crores being the value of one 20 ton arc furnace commissioned in 1967-68 and transferred to fixed assets leaving a balance of about Rs. 22 crores as capital works in progress.

(2) The MISL estimate of Rs. 36.35 crores does not include cost of

(*i*) forge shop and other finishing facilities.

(*ii*) mechanisation of mines and increasing transport capacity for doubling iron ore production required after the two new 24,000 Kva. pig iron furnaces go into operation in 1970-71.

TABLE No. 3

Production, imports, exports and consumption of saleable steel

Year	(*In thousand tonnes*)							*Percentage of production to consumption*				*Percentage of imports to consumption*
	Production							*TISCO.*	*IISCO.*	*MISL*	*HSL.*	
	TISCO.	*IISCO.*	*MISL.*	*HSL.*	*Imports*	*Exports*	*Consumption*					
1	2	3	4	5	6	7	8	9	10	11	12	13
945–46 ..	758	200	29	..	178	1	1,164	65	17	2.5	..	15
950–51 ..	796	205	29	..	344	9	1,365	58	15	2.1	..	25
956–57 ..	812	451	47	..	1,705	1	3,014	27	15	1.5	..	57
960–61 ..	1,263	722	40	566	1,417	75	3,933	32	18	1.0	14	36
963–64 ..	1,506	810	41	2,160	981	33	5,465	28	15	0.75	39	18

TABLE No. 4

Comparative figures of production and apparent consumption of steel expressed in terms of crude steel in 1960 and 1964 in selected countries.

Country.	*Total production in thousand tons*		*Total consumption in thousand tons*		*Per capita consumption in Kgs.*	
	1960	1964	1960	1964	1960	1964
Australia ..	3,753	5,099	4,070	4,778	396	429
Austria ..	3,163	3,194	1,897	1,957	268	271
Belgium—Luxemburg ..	7,188	8,731	2,604	4,065	275	419
Brazil ..	N.A.	N.A.	2,668	3,417	41	43
Bulgaria ..	253	475	866	1,013	110	124
Canada ..	5,270	8,283	5,494	8,553	308	445
Ceylon ..	N.A.	N.A.	92	77	9	7
Chile ..	422	544	531	625	70	74
China (Mainland) ..	18,400	N.A.	19,205	13,490	27	18
Czechoslovakia ..	6,768	8,377	6,501	7,005	476	498
Denmark ..	317	396	1,185	1,580	259	335
France ..	17,281	19,780	13,919	17,234	306	356
Germany, Eastern ..	3,787	4,392	5,979	7,221	347	424
Germany, Fed. Rep. of ..	34,100	37,344	29,211	33,734	527	579
Ghana ..	N.A.	N.A.	55	84	8	11
Hungary ..	1,887	2,364	2,088	2,266	209	224
India ..	3,287	6,032	4,643	7,435	11	16
Indonesia ..	N.A.	N.A.	291	196	3	2
Iraq ..	N.A.	N.A.	240	198	33	28
Ireland ..	N.A.	N.A.	160	231	56	81
Israel ..	N.A.	N.A.	359	538	170	217
Japan ..	22,138	39,799	19,476	37,417	209	324
Lebanon ..	N.A.	N.A.	182	239	107	109

TABLE No. 4—(concld.)

Country	Total production in thousand tons		Total consumption in thousand tons		Per capita consumption in Kgs.	
	1960	1964	1960	1964	1960	1964
Malaysia ..	N.A.	N.A.	195	334	28	43
Mexico ..	1,500	2,279	1,735	2,579	50	65
Netherlands ..	1,942	2,646	3,186	3,962	278	327
New Zealand ..	N.A.	N.A.	482	604	203	233
Nigoria ..	N.A.	N.A.	169	341	5	6
Norway ..	490	615	987	1,170	275	317
Pakistan ..	N.A.	N.A.	438	1,149	5	11
Peru ..	N.A.	N.A.	171	276	17	24
Philippines ..	N.A.	N.A.	425	684	16	22
Poland ..	6,681	8,573	6,282	7,963	211	256
Rumania ..	1,806	3,039	2,381	4,053	129	214
Saudi Arabia ..	N.A.	N.A.	73	147	16	23
South Africa ..	2,113	3,107	2,164	3,399	123	173
Spain ..	1,919	3,022	1,817	3,426	60	109
Swedon ..	3,218	4,392	4,077	4,771	545	623
Switzerland ..	N.A.	N.A.	1,554	2,132	290	363
Thailand ..	N.A.	N.A.	213	397	8	13
Turkey ..	266	405	602	819	22	26
U.S.S.R. ..	65,293	85,034	63,513	80,849	296	355
United Arab Republic ..	N.A.	N.A.	326	680	30	24
United Kingdom ..	24,695	26,651	22,243	23,747	425	438
United States ..	90,067	115,281	90,497	118,067	501	615
Venezuela ..	N.A.	N.A.	510	1,000	76	119
Yugoslavia ..	1,442	1,677	1,716	2,341	92	121

Note :— SOURCE .. Statistics for Iron and Steel Industry in India, 1966

N.A. .. Not Available.

TABLE No. 5

Indian Standards institute specifications for Alloy and Special Steels

Indian Standard Number	*Description*	*Number included in rationalised list*	*Chemical composition*	
			Element	*Percentage range*
1	2	3	4	5
IS : 1,570 1961 ..	High speed tool steel and die steel.	22	Carbon	0.12 to 2.30
			Silicon	0.10 to 1.20
			Manganese	0.20 to 1.75
			Nickel	1.00 to 2.20
			Chromium	0.30 to 4.50
			Molybdenum	0.25 to 1.60
IS : 3,195 1965 ..	Spring steel ..	11	Carbon	0.45 to 1.20
			Manganese	0.50 to 1.00
			Silicon	0.10 to 2.00
			Sulphur	0.050 max.
			Phosphorus	0.050 max.
			Chromium	0.90 to 1.20
			Vanadium	0.15 to 0.30
IS : 1,570 1961 .. Schedule—IV.	Alloy constructional steel.	25	Carbon	0.10 to 0.45
			Silicon	0.10 to 2.00
			Manganese	0.40 to 1.80
			Nickel	0.30 to 4.30
			Chromium	0.50 to 3.40
			Molybdenum	0.08 to 1.10
IS : 1,570 1961 .. Schedule—V.	Stainless and heat-resisting steel.	13	Carbon	0.08 to 0.85
			Silicon	0.10 to 3.75
			Manganese.	0.30 to 2.00
			Nickel	0.60 to 20.00
			Chromium	7.50 to 26.00
			Molybdenum	0.60 to 3.00
IS : 1,570 1961 .. Schedule—II, IIA and III.	Free-cutting and alloy steel.	9	Carbon	0.15 to 0.45
			Silicon	0.05 to 0.30
			Manganese	0.60 to 1.70
			Sulphur	0.08 to 0.30
			Phosphorus	0.060 max.
IS : 648 1962 ..	Electrical steel ..	4	Silicon	0.30 to 4.00
IS : 3,024 1965 ..	Sheets.			

Source—Indian Standards Institute.

TABLE No. 6

A projection of total costs and sales income of HSL plants at different levels of utilisation of capacity

Items	*Cost at* 60% *utilisation* (1967-68)	*Cost at* 70% *utilisation*	*Cost at* 80% *utilisation*	*Cost at* 85% *utilisation*	*Cost at* 90% *utilisation*	*Cost at* 100% *utilisation*
1	2	3	4	5	6	7
1. Variables :				(In Rs. Crores)		
(*a*) Raw materials	83.6					
(*b*) Power and fuel	7.5					
(*c*) Maintenance and repairs.. ..	3.9					
(*d*) Freight outward	25.3					
(*e*) Excise duty	32.4					
Total ..	152.7	178	204	216	229	254.5
2. Semi-Variables :						
(*a*) Salaries and wages	47.8					
(*b*) Stores and spares	36.8					
Total ..	84.6	86.7	88.8	90.0	91.0	93.1

3. Non-Variables :							
Miscellaneous expenses—	26.6						
Interest	29.8						
Depreciation	53.6						
Less expenses capitalised	—37.5						
Net total	72.5	72.5	72.5	72.5	72.5	72.5	
Grand total of cost	309.8	337.2	365.3	378.5	392.5	420.1	
Sales income	252.0	294.0	336.0	358.0	378.0	420.1	
Loss	57.8	43.2	29.3	20.0	14.5	..	

TABLE No. 7.

Production of pig iron, steel ingots and saleable steel in 1967-68 for all the steel plants.

Products	MISL	Hindustan Steel Limited					TISCO	IISCO	Total production
		ASP	Bhilai	Rourkela	Durgapur	Total			
				(In thousand tonnes)					
1. Pig Iron	73	..	2,080	936	959	3,975	1,798	1,089	6,935
	(1)	..	(30)	(13.5)	(13.8)	(57.3)	(25.9)	(15.8)	(100)
2. Steel Ingots—									
Mild Steel	82	..	1,785	924	738	3,447	1,933	791	6,253
	(1.3)		(28.6)	(14.8)	(11.8)	(52.2)	(30.9)	(12.6)	(100)
Special and Alloy Steel ..	10	14	..	..	..	..	..	..	24
	(42)	(58)							(100)
3. Saleable Steel—									
Mild Steel	72	..	1,252	527	640	2,419	1,534	613	4,638
	(1.6)	..	(27.1)	(13.8)	(11.4)	(52.3)	(32.9)	(13.2)	(100)
Alloy Steel	8	7	..	..	..	..	..	..	15
	(53)	(47)							(100)

Notes.—(1) Figures in brackets represent percentages to total production.

(2) Pig Iron production of integrated steel plants includes production of hot metal utilised in the plant for steel making. The following quantitites of machine cast pig iron (in thousand tonnes) were despatched during the year:—

Name of plant	Quantity despatched	% of despatch to its production of pig iron
MISL	18	24
HSL	1,081	27
TISCO	4	0.2
IISCO	95	9

(3) Production of Semis compared to total Saleable Steel was as under :

Name of Plant	Quantity of semis		Quantity of finished steel		% semis to total saleable steel	
	Mild	SP & AS	Mild	SP & AS	Mild	SP & AS
MISL	35	6	37	2	49	75
ASP	..	3	..	4	..	43
TISCO	526	..	1008		34	..

SP & AS — Special & Alloy Steels.

TABLE No. 8

Chemical analysis and JPC selling prices of pig iron

The Joint Plant Committee have fixed the following revised base price for pig iron effective from the midnight of 1st August 1968. These prices are inclusive of an excise duty element of Rs. 40 per tonne and an equalised freight element of Rs. 46 per tonne.

Grade	*Silicon per cent*	*Phosphorus per cent max.*	*Sulphur per cent max.*	*Base Price F.O.R. Railhead Station Rs./tonne*	
				High Manganese 1.00—1.50%	*Manganese* 0.50 *to under* 1.00%
1	2	3	4	5	6
IS—224/1958, MEDIUM PHOS :					
Foundry 1.	2.75 to under 3.75	0.40	0.050	440	438
2.	2.25 to under 2.75	0.40	0.050	425	423
3.	1.75 to under 2.25	0.40	0.050	390	388
4.	1.25 to under 1.75	0.40	0.050	385	383
Special basic	0.75 to under 1.25	0.40	0.050	375	273
Standard basic.	Under 0.75	0.40	0.050	370	368
Spun pipe pig Iron (HP., LM.)	2.2 to 2.4	0.73—0.90	0.050 max.	..	398 (0.45—0.5% Manganese)

Note :— (1) The extra for silicon for each range of increase of 0.25% above 3.25% is Rs. 7. 50.

(2) All other existing extras and penalties for pig iron in force on 19th August 1965 (when pig iron was decontrolled) remain unchanged.

TABLE No. 9.

Capacity and actual production of different units at MISL for the years 1966-67, 1967-68 and 1968-69.

Items	*Rated capacity in Tonnes/ Annum*	Production in tonnes/Annum								
		1966-67			1967-68			1968-69		
1	2	3			4			5		
I. Pig Iron—										
(*a*) Blast furnace ..	24,500	24,671			23,771			26,833		
(*b*) Electric Pig Iron—										
Furnace No. 1 ..	30,500	26,369			24,057			17,048		
Furnace No. 2 ..	30,500	24,737			25,361			30,700		
		Mild steel	*Special steel*	*Total*	*Mild steel*	*Special steel*	*Total*	*Mild steel*	*Special steel*	*Total*
II. Steel Ingots—										
(*a*) Open hearth ..	45,000	40,821	146	40,967	41,866	25	41,891	40,671	..	40,671
(*b*) L.D. Converters ..	80,000	13,690	651	14,341	20,716	720	21,436	36,547	3,251	39,798
(c) Electric Arc Furnace										
20 T. No. 1	20,000	7,748	11,418	19,166	9,609	6,697	16,306	1,008	12,092	13,100
(*d*) do T. No. 2	20,000	..	..	..	7,619	2,333	9,952	953	12,095	13,678
(*e*) do 8 T.	9,000	..	..	..	..	..	..	469	5,806	6,275
(*f*) do 6 T.	7,000	673	4	677	1,912	..	1,912	..	..	1,206
(*g*) do 3.5 T.	5,000	369	6	375	723	..	723	..	..	2,392
Total ..	186,000	63,301	12,225	75,526	82,445	9,775	92,220	79,648	23,244	117,220

TABLE No. 9—(concld.)

1	2	3			4			5
III. Saleable Steel—								
(*a*) Semis	..—	6,831	2,934	9,765	35,540	5,904	41,444	
(*b*) Finished Sections	..— 124,000	54,525	4,842	59,367	36,604	1,885	38,489	
Total	..	61,356	7,776	69,132	72,454	7,789	79,933	

Note.—(1) 2 Units of 24,000 Kva Electric Pig Iron furnaces each with a capacity of 60,000 tons/annum are under construction and are expected to go into production in 1970.

(2) The blast furnace is a small furnace working on either charcoal or mixed fuel.

TABLE No. 10

Chemical analysis of special and alloy steels in the production line of MISL

	Equivalent to	*Chemical composition*				
		%C	*%Si*	*%Mn*	*%P*	*%S*
Carbon alloyed structural steels (for case hardening, hardening and tempering) and carbon alloyed tool steels						
M-KE10	EN2A, EN2B, EN2E, EN32A, EN2A/1, EN32, EN32C ..	.06–.12	.15–.40	.30–.50	Max. .035	Max. .035
M-KE16	EN3, EN32B ..	.12–.16	.15–.30	.30–.30	.035	.035
M-KE25	EN2D, EN4, EN4A, EN2C, EN3A, EN3C, EN3D, EN5A ..	.20–.30	.20–.30	.40–.60	.035	.035
M-KE35	EN6, EN6A, EN5, EN5B, EN5C, EN5D, EN5K, EN6K, EN8A, EN8B.	.32–.41	.20–.30	.50–.70	.035	.035
M-KE45	EN8, EN8D, EN8K, EN43A, EN43B, ..	.42–.48	.20–.30	.50–.70	.035	.035
M-KE50	EN43C ..	.48–.52	.20–.30	.50–.70	.035	.035
M-KE55	....	.50–.57	.20–.35	.50–.70	.035	.035
M-KE60	EN9, EN9K, EN43D, EN42B, EN43C, EN43J ..	.55–.65	.20–.30	.50–.70	.035	.035
M-KE70	EN42F, EN43E, EN42C ..	.66–.75	.20–.30	.60–.80	.035	.035
M-KE85	EN42, EN42D, EN42J ..	.76–.90	.20–.35	.70–.90	.035	.035
M-KE100	EN44, EN44C, EN44D, EN44B ..	.95–1.10	.20–.35	.50–.70	..035	.035
Silicon alloyed structural steels (Spring Steels)—						
M-KESW	EN45, EN46 ..	.46–.52	1.50–1.80	.60–.80	.040	.040
M2Si	EN45A ..	.60–.70	1.50–1.80	.60–.80	.040	.040
Manganese alloyed structural steels (for hardening and tempering)						
M-HM	EN14B, EN14A/8, EN15B ..	.27—.33	.20–.35	1.20–1.50	.035	.035
M- HMA	EN8E, EN8C, EN8F ..	.37–.43	.30–.50	.80–1.00	.035	.035

TABLE No. 10—(concld.)

	Equivalent to		Chemical composition				
			%C	%Si	%Mn	%P	%S
Chromium-Molybdenum-alloyed structural steels (for hardening and tempering)							
M-V140	EN19, EN19A, EN19-B, EN19C, EN20, 42Cr. Mo4	..	.38-.44	.20-.35	.60-.80 Cr .100-.120 Mo .20-.30	.035	.035
...-CMO	24CrMo5, 25CrMo4, 16CrMo4		.20—.29	.20-.35	.50-.70 Cr 1.00-1.20 Mo .20-.30	.035	.035
M-CI35		..	.31-.37	.20-.35	.60-.80 Cr .90-1.20 Mo .15-.25	.035	.035
Manganese alloyed structural steels (for hardening and temperirg)							
M-HM75	EN15, EN15A, EN15AM	..	.34 .40	.20-.35	.160-1.90	.035	.035
Mn. and Si-alloyed structural steels (spring steels)							
M-2Mn	46Mn7	..	.43-.48	.20-.35	1.60-1.90	.040	.040
Cr (Mn.) alloyed structural steels (for case hardening)							
M-EO	15Cr5	..	.12-.15	.20-.35 Cr .60-.90	.40-.60	.035	.035
M-EM80	16Mn Cr5	..	.13-.18	.20-.35 Cr .80-1.10	1.00-1.30	.035	.035
M-EM95	21Mn, Cr5, 22Mn Cr 6, 20Mn Cr5	..	.16-.21	.20-.35	1.10-1.40 Cr. 1.00-1.30	.035	.035

(All in Millimeters)
Rounds : 50, 52, 53, 6o, 63, 70, 73, 80 and 83.
Billets : 50 to 95 (in steps of one mm.)
Blooms : 100, 120, 125 and 150.

TABLE No. 11

Scrap generated within the plant

	Production units	*Quantity (in tonnes)*
1.	L. D. converters	3,000
2.	E. A. furnaces 20 & 8 tons	4,100
3.	Open hearth	4,500
4.	3½ T & 6 T arc furnaces	1,000
5.	Old rolling mill	2,450
6.	Strip & rod mill	1,250
7.	Annealing & conditioning shop.. ..	2,500
8.	Blooming and heavy section mill ..	8,000
9.	Forge shop	5,000
10.	Combined bar & rod mill	1,450
11.	Finishing mill	3,000
	Total	36,250

TABLE No. 12

Comparative details of operating units and capacities in different steel plants

		H.S.L. Units				
MISL	*ASP*	*BHILAI*	*ROURKELA*	*DURGAPUR*	*TISCO*	*IISCO*
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Coke ovens						
No coke ovens. Coke is purchased and quantity purchased in 1967-68 was 40,548 tonnes.	Not required.	6 batteries of 65—ovens each. Total yearly rated capacity 2.44 million tonnes. Through put of coal 9,040 tonnes per day.	4 batteries. Total No. of ovens 290 Total yearly rated capacity 1.88 million tonnes. Through put of coal 2.22 million tonnes/annum.	4 batteries. Total No. of ovens 312. Total daily rated capacity 5,100 tonnes coke. Through put of coal 7,040 tonnes/day.	10 batteries. Total No. of ovens 512. Through put of coal per day 13,600 tonnes.	5 batteries. Total No. of ovens 308. Through put of coal per annum, 2.275 million tonnes.
Sintering Plant						
Pan type. Annual capacity 80,000 tonnes.		3 *Units*. Total annual capacity 1.52 million tonnes. Hearth area 50 sq.m. each.	2 *Units* each of—2,000 tonnes per day Hearth area 127 sq.m. each.	2 Units of each of 2,500 tonnes/day. Hearth area 142.7 sq.m.	2 machines each of 2,500 tonnes/day. Not known.	No sintering plant

Pig Iron Plant

1 blast furnace of 8' dia. capacity 80 tonnes/day.	..	3 blast furnaces of 919 cu.m. and capacity 1,135 tonnes/day.	3 blast furnaces each of 990 cu.m. each of capacity 1,000 tonnes/day.	3 furnaces each of 1,169 cu.m. capacity 1,270 tonnes/day.	1 blast furnace of 860 cu.m. and capacity 1,100 tonnes/day.	2 blast furnace. each of 434 cu.ms and capacity 700 tonnes/day.
2 Electric Pig Iron furnaces of 29' dia. 13,200 Kva. each capacity 100 tonnes/day each.		2 furnaces each of 1,537 cu.m. and capacity 1,738 tonnes/day.	1 blast furnace of 1,448 cu.m. and capacity 1,500 tonnes/day.	1 furnace of 1,550 cu.m. and capacity 1,500 tonnes.	1 —do— 630 cu.m. 880 tonnes/day 1 of 608 cu.m and 880 tonnes per day	2 of 1,041 cu.m. tonnes. and 1,200 tonnes each Total annual capacity 1.3 million tonnes.
Total annual capacity 60,000 tonnes.		Total annual capacity 2.35 million tonnes. Ratio of capacity output to cu.m. 1.24 (max).	Total annual capacity 1.5 million tonnes.	Total annual capacity (—)1.82 million tonnes.	1 of 939 cu.m. and 1,100 Tonnes per day 1 of 538 cu.m. and of 660 tonnes. per day	Ratio output/cu.m. 1.6 (max).
			Ratio of capacity output/cu.m. 1.04 (max).	Ratio of capacity output/cu.m. 1.08 (max).	1 of 1,337 cu.m. and 1,650 tonnes. per day Total annual capacity 2.14 million tonnes/annum. Ratio of output/cu.m. 1.45 (max).	

TABLE No. 12 (contd.)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Steel Melting Shops—						
Mixers						
1 Unit of 300 tonnes capacity	..	2 Units of 1,300 tonnes each.	3 Units of 1,100 tonnes each.	2 Units of 800 tonnes each 1 Desiliconising Unit.	2 Units of 800 tonnes each and 1 of 1,300 tonnes.	
Open hearth (Capacity per heat).						
25 tonnes	....	5 Units of 250 tonnes. 5 Units of 500 tonnes	4 Units of 80 tonnes each.	8 Units of 220 tonnes. 1 Unit of 110 tonnes	4 Units approx. 150 tonnes each 2 Units of 250 7 Units of 200 2 Units of 190 tonnes.	1 Unit 300 tonnes 5 Units of 200 tonnes. 1 Unit of 100 tonnes.
L. D. Converter—(Capacity).						
2 Units of 12 tonnes per blow.	....	....	3 Units of 40 tonnes each 2 Units of 60 tonnes each		Bessemer converter. 3 Units of 25 tonnes each 3 Units of 32 tonnes each.	3 Units of 25 tonnes each.

Electric Arc Furnace—(Capacity per heat).

2 Units of 20 tonnes.	2 Units of 50 tonnes.	....	....	....	....	....
1 Unit of 8 tonnes.	1 Unit of 10 tonnes.					
	Induction furnaces					
1 Unit of 6 tonnes	1 of 2 tonnes					
1 Unit of 3.5 tonnes	1 of 1 tonne.					

Steel Ingot—(Capacity)

1,86,000 tonnes.	1,00,000 tonnes	2.5×10^6 tonnes	1.8×10^6 tonnes	1.6×10^6 tonnes	2×10^6 tonnes.	1×10^6 tonnes.
Blooming Mill	**Rolling Mills**	**Rolling Mills**	**Rolling Mills**	**Rolling Mills**	**Blooming Mills**	**Blooming Mills**
Single stand 3 Hi. 680 mm. dia. with 3 stands 3-Hi. 600 mm. dia. finishing Mill.	Soaking pits 6 groups.	Soaking pits 13 groups.	Soaking pits 11 groups.	Soaking pits 16 groups.	1–40 & 1–46 Reversing mills.	2-Hi. reversing. 42″ × 96″ size rolls
Merchant Mill	**Blooming Mill**	**Blooming Mill**	**Blooming Mill**	**Blooming Mill**	**Steel Bar & Billet Mill.**	**Steel Bar & Billet Mill.**
2–500 mm. 3-Hi. stand and 5-300 mm. 3-Hi. finishing stands 520 mm. 3 Hi. Roughing stand and 1–3 stand 440 mm.	900 mm. × 2,200 mm. 2-Hi. reversing mill. Annual capacity 3 lakh tonnes.	2-Hi. reversing mill with 1,150 mm. dia. rolls. Annual capacity 2.14 million tonnes.	2-Hi. 1,180 in wide. mm Annual capacity 1.8 million tonnes.	1–42″. 2-Hi. reversing stand & 1–32″—2-Hi. reversing stand Annual capacity 1.6 million tonnes.	2 Nos.	Morgan. No. of stands in tandem 10

TABLE No. 12 (concld.)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
roughing train 420 mm. 2-Hi. stand 1-5 stand 360/330 mm. 2-Hi. cross country mill and continuous mill comprising 4–330 mm. stands 1–500 mm.–3 Hi. stands 5–3 Hi. intermediary stands of 12″ dia. 2 Finishing mills – 1 Rod Mill of 4–3 Hi. 10″ stands and strip mill of 3–12″ continuous stands.	**Steel Bar & Billet Mill** 2 High 700 mm. × 1800 mm. 2 stand reversing mill & 2 Hi. 650 mm. × 1300 mm. finishing mills.	**Steel Bar & Billet Mill** 1000/700/500 mm. continuous billet mill with 12 stands. Annual capacity 1.26 million tonnes.	**Plate Mill** 4-Hi. 31000 mm. wide. 1 unit. Annual capacity 3.60 lakh tonnes.	**Steel Bar & Billet Mill** Roughing train with 2 horizontal and 2 vertical stands and a 4 stand finishing train. Annual capacity 1.012 lakh tonnes.	**Plate Mill** 96 roughing mill and 1 finishing stand in tandem 3 Hi.	**Sheet Mill** 2–3-Hi. roughing stands and 4–2.H-i finishing stands.
	Sheet Mill 1825 mm. × 800/640/800 mm. 3 Hi. roughing mill and 1–2 stand 1525 mm. × 750 mm. finishing mill. 1 cold sendezimer mill. 1–1525 mm. × 650 mm.–2 high skin pass mill. Annual capacity 2,000 tonnes.	**Rails & Structural** 950/800 mm. mill with 2 Hi. roughing stand and 2 Nos. 3 Hi. finishing stand and 1 Nos. 2 Hi. finishing stand. Annual capacity 7.50 lakh tonnes.	**Wire Rod Mill** 1–1.8 M. wide 4 Hi. reversing roughing stand and 1.8 M. wide & 4 Hi. non-reversing roughing stand.	**Rails & Structural** 1–26″ 2 Hi. roughing stand. 2–24″ 3 Hi. intermediate stands. 1–24″ 3 Hi. finishing stands. Annual capacity 2.39 lakh tonnes including fish plates.	**Rail & Structural Mill** 28″–2 Hi. 3 stand rail & structural Mill 28″ medium & high structural mill. **Merchant Mill** 2 Nos.	**Rail & Structural Mill** 34″–1.2 Hi. reversing stand. 1–2 Hi. reversing intermediate stand. 1-2 Hi. reversing finishing stand.

Bar Mill	Merchant Mill	Hot Strip Mill	Merchant Mill	Wheel and Axle Plant	Rails and Structural Mill—*contd.*
15 stand mill—annual Capacity 37,000 tonnes.	350 mm. with 12 stands— annual capacity 5 lakhs tonnes.	6 continuous 1.7 m. wide 4 high finishing stands—annual capacity 1.2 lakh tonnes.	7 stand roughing train-2 stand intermediate train 6 stand looping train—annual capacity 2.55 lakh tonnes.	1 Unit	18" Two-3-Hi. non reversing roughing stands. 1—3 Hi non-reversing intermediate stands 1—2 Hi. reversing finishing stand.
Forge Shop	**Wire Rod Mill**	**Cold Rolling Mill**	**Sleeper Plant**	**Skelp and Strip Mill**	**Merchant Mill**
Annual capacity 12,000 tonnes.	39 stands, 250 mm. Wire Rod Mill—Annual capacity 4 lakh tonnes.	3 single stand—4 cold reducing mills width 1700/1420/1200 mm. 3 single stand, 4 Hi. skin pass mills 1700/1200 mm. width.	75,000 tonnes annual capacity.	1 Unit	2 Hi. morgan 19 stands Edgers 4 Nos.
		Electrical Sheet Mill	**Wheel and Axle Plant**		
		Three 2 Hi. hot rolling stands. Three .2 Hi. temper roll stands—annual capacity 63,000 tonnes.	93,000 tonnes annual capacity.		
		Pipe Plant	**Skelp Mill**		
		ERW Pipes and diam 219 mm. to 508 mm.	2 Hi. horizontal. stands 11 and vential edging stands 6 Nos.		

TABLE No. 13

Production and performance of the MISL operating units for 1967-68 and 1968-69

Production unit	*Rated capacity in tonnes*	*Actual production*				*Remarks*
		1967–68		1968–69		
		Tonnes	*% of rated capacity*	*Tonnes*	*% of rated capacity*	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Pig Iron—						
Blast Furnace ..	24,500	23,771	97	26,833	110	Less production in 1967-68 due to intermittent furnace troubles. Increased production in 1968-69 due to improved raw material preparation. The rated capacity itself as given by MISL seems to be on the low side.
Electric Pig Iron Furnace (1) ..	30,500	24,057	79	17,048	56	The furnace was shut down for major repair from 11th March 1968 to 4th October 1968. In 1967-68—
Electric Pig Iron Furnace (2) ..	30,500	25,361	83	30,700	100	operation troubles.

Steel Ingots—						
Open hearth ..	45,000	41,891	93	40,671	90	Furnaces were shut down for relining but the relining period was about 60-62 days as against the normal time of 30 days.
L. D. converters ..	80,000	21,435	27	39,798	50	(1) Shortage of hot metal from pig iron units. (2) Shut down of oxygen plant due to trouble in regeneration unit.— (3) Longer time taken for each heat.
Arc furnaces 20 tonne (1)	20,000	16,306	82	13,100	65	(1) Furnace produced in 1967-68 special steel (6,697 tonnes) in addition to mild steel (9,608 tonnes). (2) In 1968-69 furnace down time was 46 days for major and other repairs. (3) The time taken for each heat is considerably longer than in other similar plants.
20 Tonne (2) ..	20,000	9,952	50	13,678	58	(1) Furnace was commissioned in July 1967 and therefore the available time for 1967-68 was only 255 days. (2) Furnace worked only for 189 days in 1967-68 and was down for repairs and relining for 66 days which is abnormally high. (3) The average time taken for each heat is considerably longer than in other similar plants. (4) In 1968-69 furnace down time was 35 days for major and other repairs and the average time taken for each heat was longer than normal.

TABLE No. 13 (Concld.)

1	2	3	4	5	6	7
8 Tonne	9,000	..	..	6,275	70	Commissioned in April 1968 and was shut down from 27th October 1968 to 30th January 1969 due to explosion of air circuit breaker.
Finished Steel—						
Old rolling mills ..	30,500	22,474	74	29,338	97	To accommodate the work of bar and rod mill under the conversion scheme, this mill had to be shut down from 17th September 1967 to 19th November 1967.
Strip and Rod mill ..	13,000	11,425	88	12,807	98	Operational troubles in 1967-68.
New rolling mill ..	80,000	46,034	58	44,285	55	(1) Operational troubles. (2) Short supply of steel ingots. (3) Shutdown for 75 days in 1968-69 for major repairs.
Ancillary Units—						
Sintering plant ..	80,000	22,246	21	..	..	Breakdown of rotor and plant shutdown in 1967-68. This unit is not working.

TABLE No. 14

Norms and actual operational efficiencies of production units at MISL.

	Iron ore	*Lime stone*	*Coke*	*Power*	*Electrode paste*	*Production per day*	*Remarks*
1	2	3	4	5	6	7	8
Norms per tonne of pig iron ..	1.5	0.45	0.50	2,500 Kwh	15.20 Kg.	90 Tonnes	90 tonnes for 340 days gives 30,600 tonnes per annum. This is based on 85 power factor and .9 load factor.
Actuals—electric pig iron furnace—I	1.52	0.42	0.44	2,737 Kwh	26.00 Kg.	71 Tonnes	Actual consumption of coke includes about 33% of lignite which has a higher caloric value than coke.
Electric pig iron furnace—II ..	1.52	0.42	0.44	2,705 Kwh	26.00 Kg.	70 Tonnes	Electric pig iron furnaces I and II worked for 340 days and 362 days respectively in 1967-68.

TABLE No. 14 (contd.)

Steel melting	*Tap to tap time*	*Frequency of relining*		*Time taken*		*Total time for relining in year*	*Furnace availability in days*	*% of yield production to total charge*	*Melting loss*	*Scrap*	*Production capacity based on these norms (in tonnes)*
		Top or roof	*Complete*	*Top*	*Complete*						
1	2	3	4	5	6	7	8	9	10	11	12
Open hearth											
Norms ..	8 hrs.	After 120 heats	After 240 heats	1 day	6 days	33 days	332 days	85	7.5	7.5	45,000
Actuals ..	9 hrs.	..	..	..	..	..	306 days	86.5	6.0	7.5	41,891
L. D. Converters (2 of 12 tonnes capacity)											
Norms ..	1 hr.	After 180 heats	..	5 days	..	152 days	213 days	85	10	5.0	1,00,000
Actuals ..	2½ hrs.	—	..	..	..	..	201	81	7	12	21,435
20 Tonne electric furnace. Norms	6–8 hrs.	After 200 heats.	..	2 days	..	12 days	354 days	85	10	5	21,000
Actuals Furnace No. I ..	8 hrs.	..	..	..	..	..	268 days	81	15	4	16,306
No. II ..	9 hrs.	..	..	..	..	..	189 days	81	15	4	9,952

TABLE No. 14 (concld.)

Rolling mills	*Yield*	*Scrap*	*Heating loss*	*Defectives*	*Net production*	*Mill utilization*
1	2	3	4	5	6	7
Norms ..	85	11	4	1.7	83.3	300 days
Actuals—						
Old ..	84	13	3	4.0	80	252 days
Strip and Rod Mill	79	18	3	7	72	305 days
Now ..	80	18	2	17	63	279 days

Percentage of rolled products to the basic material rolled.

Rolling mill productivity indices—output in tons per rolling hour

	MISL	*Bhilai*	*Durgapur*	*TISCO*	*IISCO*
Merchant mill output ..	5.0	82.3	50	34	46
Mill utilisation ..	75.0	76.8	62.5	62.2	80.5

TABLE No. 15

Anticipated production flow sheet as envisaged by MISL for 1,09,000 tonnes of pig iron for sale, 87,000 tonnes of alloy and special steels and 39,000 tonnes of mild steel products

Iron making	*Requirement in Tonnes*			
	Blast furnace	*E.P.I.F. 1 & 2*	*E.P.I.F. 3 & 4*	*Total*
1	2	3	4	5
Raw materials :				
Iron ore	24,000	64,000	1,38,000	2,26,000
Sinter	20,000	35,000	60,000	1,15,000
Lime-stone	5,300	29,700	59,400	94,400
Coke	4,700	30,000	60,000	94,700
Charcoal	18,000	..	..	18,000
Yield				
Pig iron	26,000	60,000	1,20,000	

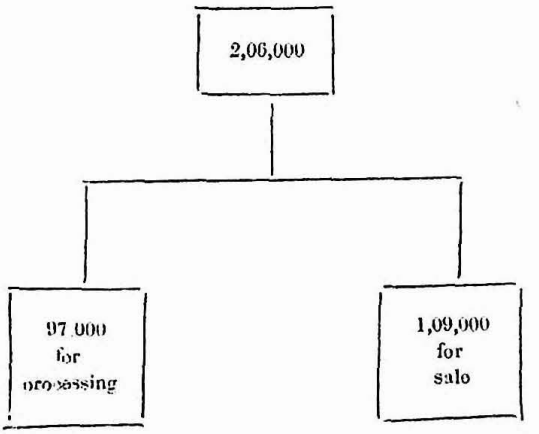


TABLE No. 15 (contd.)

Steel making	*Requirement in tonnes*				
	L.D.	*E.A.* 20 & 8	*O.H.* 1 & 2	*E.A.* 6 & 3.5*T*	*Total*
1	2	3	4	5	6
Raw materials :					
Hot Metal (Pig Iron) ..	70,000	8,000	18,000	1,000	97,000
Scrap ..	23,000	71,700	32,800	13,700	1,41,200
Alloys ..	5,000	6,400	1,200	800	13,400
Yield					
Special and alloy steel ..	70,000	60,000			
	1,30,000 (Ingot tonnes)				
			35,000	11,000	Yield Mild Steel
			46,000 (Ingot tonnes)		
	1,12,000				
	Sale as ingots .. 14,850 Steel foundry .. 3,150 Total .. 18,000				

TABLE No. 15 (contd.)

For special and alloy steel—Rolling and finishing

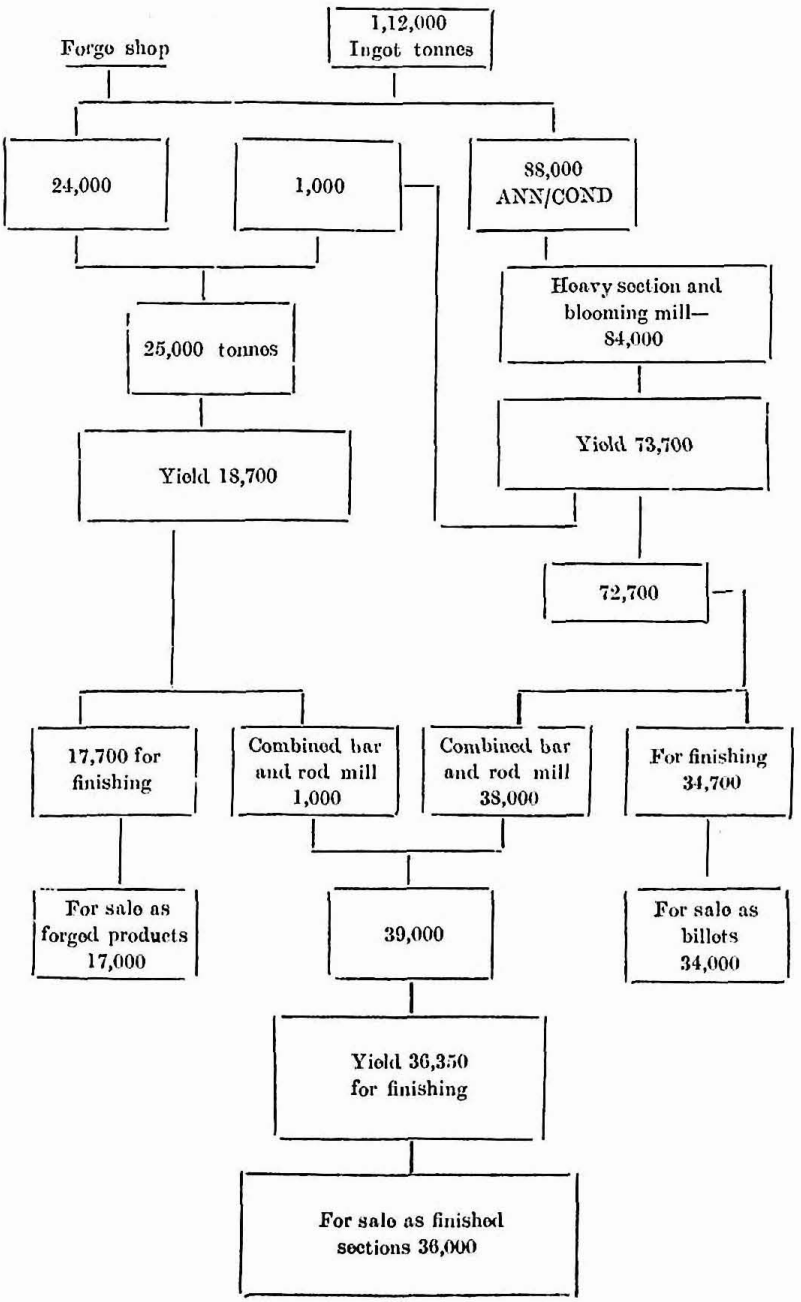


TABLE No. 15 (concld.)

For mild steel—Rolling and finishing

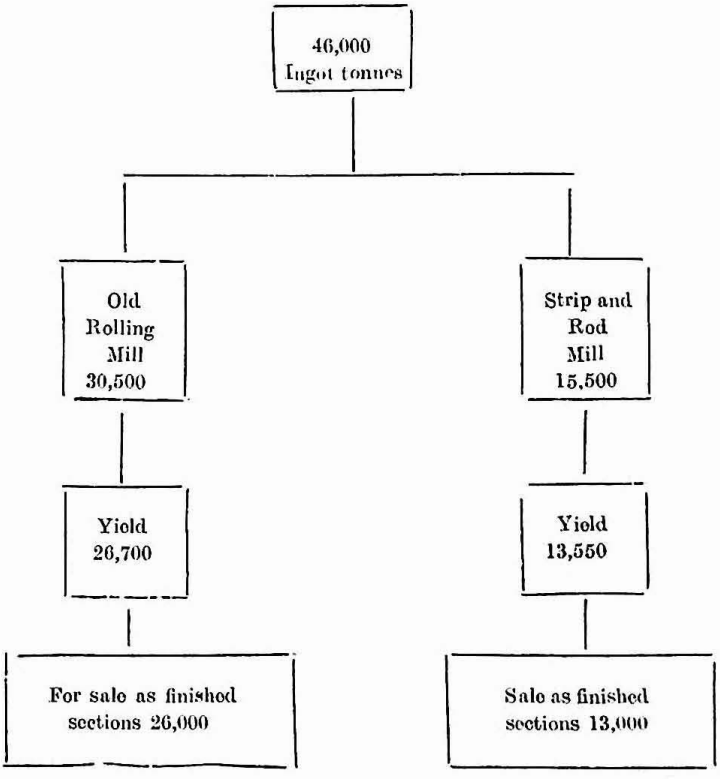


TABLE No. 16

Summarised profit and loss account of MISL (In lakhs of Rupees)

Particulars	*EXPENDITURE*						*Particulars*	*INCOME*					
	1962-63	1963-64	1964-65	1965-66	1966-67	1967-68		1962-63	1963-64	1964-65	1965-66	1966-67	1967-68
Raw materials ..	139	223	175	259	175	231	Sale of products	681	780	855	886	904	1,180
Salaries and wages	142	149	159	180	212	243							
Stores and spares ..	102	106	73	80	85	123	Other miscellaneous income.	45	44	75	212	238	139
Maintenance and repairs.	3	7	37	51	60	67							
Fuel, power and water.	192	218	296	321	367	393	Accretion to closing stock.	(—)23	23	(—)10	80	63	(—)22
Freight outward ..	..	..	..	..	..	19							
Excise duty ..	6	3	9	5	12	138							
Other expenses ..	11	18	28	171	209	63							
Depreciation ..	58	70	42	53	71	146							
Interest on loan ..	40	57	77	97	159	205							
Less transferred to capital account	(—) 55	(—) 74	(—)45	(—)91	(—)189	(—)120							
Total ..	638	777	851	1,126	1,161	1,508	Total ..	703	847	920	1,178	1,205	1,297
Profit ..	65	70	69	52	44	..	Loss ..	..	..	..	..	..	211
GRAND TOTAL .	703	847	920	1,178	1,205	1,508	GRAND TOTAL ..	703	847	920	1,178	1,205	1,508

Note:— (1) Trial operation expenses of Rs. 129 and 172 lakhs are included in 1965-66 and 1966-67 respectively.

(2) Trial operation expenses capitalised during 1965-66 and 1966-67 were Rs. 30 and 68 lakhs respectively.

(3) Depreciation not charged to P. & L. account for the years 1965-66 and 1966-67 were Rs. 60 and 64 lakhs respectively.

(4) Interest capitalised for the years 1964-65 ; 1965-66 ; 1966-67 and 1967-68 were Rs. 43, Rs. 61, Rs. 121 and 120 lakhs respectively

Details of transfer to capital account :

1967-68	..	Interest only.					
1966-67	..	Interest (121)	+	Trial operation	..	..	(68)
1965-66	..	Interest (61)	+	Trial operation	..	..	(30)
1964-65	..	Interest (43)	+	Miscellaneous	..	..	(2)
1963-64	..	Interest (28.4)	+	Development and minor capital works	..	..	(45.6)
1962-63	..	Interest (12)	+	Development and minor capital works	..	..	(43)

TABLE No. 17

Comparative profit and loss account of Indian steel producers for 1967-68.

	MISL	*HSL*	*TISCO*	*IISCO*		*MISL*	*HSL*	*TISCO*	*IISCO*
EXPENDITURE			(In lakhs of Rupees)		**INCOME**				
Raw materials, etc. ..	231 (14.2)	8,359 (24.1)	2,329 (24.9)	1,680 (22.2)	Sale of products ..	1,180	25,177	13,219	6,224
Wages and salaries ..	243 (15.0)	4,779 (13.8)	2,708 (20.8)	1,699 (22.3)	Other miscellaneous income.	139	550	548	1,078
Power and fuel ..	393 (24.3)	754 (2.1)	362 (2.8)	129 (1.7)	Accretion to closing stock.	(—)22	1,251	(—)5	371
Stores and spares ..	123 (7.5)	3,685 (10.6)	570 (4.4)	1,008 (13.2)					
Maintenance and repairs.	67 (4.1)	388 (1.1)	711 (5.4)	593 (7.8)	Total ..	1,297	26,978	13,762	7,673
Miscellaneous expenses	63 (3.9)	2,663 (7.7)	568 (4.3)	443 (5.8)					
Freight outward ..	19 (1.2)	2,532 (7.3)	1,071 (8.2)	487 (6.4)					
Excise duty ..	138 (8.5)	3,243 (9.4)	2,298 (17.7)	870 (11.4)					
Interest ..	205 (12.3)	2,979 (8.6)	286 (2.2)	248 (3.2)					
Depreciation ..	146 (9.0)	5,358 (15.3)	1,212 (9.3)	455 (6.0)					
Less expenditure capitalised.	(—)120 (*)	(—)3.750 (**)	(—)87	..					
Total ..	1,508	30,990	12,928	7,572					
Profit for the year ..	..	..	834	101	Loss for the year ..	211	4,012	..	..
Total ..	1,508	30,990	13,762	7,673	Total ..	1,508	30,990	13,762	7,673

Notes :—(1) *Interest capitalised Rs. 120 lakhs.

(2) **Expenditure during construction		..	Rs.	116 lakhs
do	Mtp	..	Rs.	1,087 lakhs
do	Expansion		Rs.	2,547 lakhs
		Total	Rs.	3,750 lakhs

(3) Figures in bracket represent % on total expenditure before capitalisation.

TABLE No. 18

MISL'S unitwise analysis of profit and loss for the year 1967-68

Pig iron Units	*Unit cost*(1) *of production in Rs.*	*Sale rate per ton in Rs. excluding excise duty*	*Total quantity sold in tons*	*Total sale value in Rs. Lks.*	*Total cost in Rs. Lks.*	*Difference in Rs. Lks.*	*Stock adjustment in Rs. Lks.*	*Total profit or loss in Rs. Lks.*
1	2	3	4	5	6	7	8	9
Blast Furnace—								
Charcoal pig iron	363	407	5,682	23.13	20.63	+2.50	+1.32	+3.77
Mixed fuel pig iron	341	330	497	1.64	1.69	—0.05	+1.38	+3.21
Electric pig iron furnace pig iron ..	320	335	11,836	39.70	37.87	+1.83		
Steel Units—								
Old rolling mills-mild steel ..	669	661	17,831	117.90	119.29	—1.39	—9.50	—12.30
Special steel	1,101	923	790	7.29	8.70	—1.41		
Strip and rod mill—								
Coils	754	767	9,600	73.63	72.38	+1.25		
Hoops	1,004	980	94	0.92	0.94	—0.02	—0.89	+0.34

New Rolling Mills : Mild Steel

Blooms	.. ..	755	429	2,128	9.13	16.00	—6.87		
Sections	.. ..	926	597	3,229	18.22	29.90	—11.68	—44.95	—286.00
Billets	.. ..	926	498	28,717	143.17	265.92	—122.75	—85.14 (2)	
Special steel	.. ..	1,345	1,004	4,286	43.04	57.65	—14.61		
Losses in pipe foundry and spun pipe plant		..	..	..	..	..	..	..	—11.29
Foundries	.. ..	..	..	..	..	..	..	..	+12.70
Profit from ferro-alloys or ferro-silicon (mainly from ferro-silicon plant).		..	..	..	..	..	..	..	+56.27
Miscellaneous credit	.. ..	..	..	..	..	..	..	..	+21.96
Net loss	.. ..	..	..	..	..	..	..	..	—211.34

Note :—(1) Includes depreciation and excludes interest charges.

(2) Rs. 85.14 lakhs represents interest on loans pertaining to the mild steel expansion programme completed in 1965. There are no interest charges pertaining to other production units.

TABLE No. 19

Economies of electric arc furnace for production of alloy and special steels using(a) L.D. metal and (b) scrap as given by M.I.S.L.

Item of cost	*L.D. Duplexing metal in arc furnace Cost per tonne*	*Scrap based arc furnace for alloy steel Cost per tonne*
Annual production	74,500 (Tonnes)	42,000 (Tonnes)
	Rs.	Rs.
Material cost	538	270
Ores and alloys	122	23
Fluxes	9	17
Fuel	84	98
Labour	18	38
Refractories for maintenance	25	19
Repairs and supplies	107	106
Overheads	11	20
Depreciation	23	51
Interest charges	51	44
Total ..	988	681

TABLE No. 20

Break-up of balance sheet of Mysore Iron and Steel Limited as on 31st March 1968.

Assets	*Rs. in lakhs*		*Liabilities*	*Rs. in lakhs*	
1. Fixed Assets :			1. Share capital :		
Gross Block excluding works in progress ..	2,214		Subscribed ..	400	
Less : Depreciation ..	1,437	1,777	Share application deposit ..	1,215	1,615
2. Capital works in progress ..		2,223	2. Reserves and Surplus ..		226
3. Investments and Current Assets ..		1,148	3. Secured Loans :		
4. Intangible assets (Deferred revenue expenses, Net loss, etc.) ..		218	From Banks ..	635	
			Mysore Housing Board ..	4	639
			4. Un-secured Loan :		
			Government of India ..	1,136	
			Government of Mysore ..	61	
			German Bank (K.F.W.) ..	1,199	
			Interest accrued and due ..	92	2,488
			5. Current liabilities ..		398
Total		5,366	Total ..		5,366

TABLE No. 21

Cash flow statement for 1967-68—MISL

	Rs.
Funds derived from :	
Unsecured loans	12,97,26,988
Current assets	25,22,350
Depreciation for the year	1,45,60,620
Net reduction in reserves and surplus.. ..	60,361
	14,68,70,319
Funds expended on :	
Additions to fixed assets	1,91,68,443
Additions to capital works in progress ..	6,52,10,696
Mines development expenses	43,605
Secured loans	3,95,19,256
Current liabilities	13,29,416
Net loss for the year	2,11,33,568
Expenses relating to previous year	4,65,335
	14,68,70,319

Note.—The figures in the statement have been arrived at after excluding the book adjustment of Rs. 10.18 crores for converting the dues of MISL to Mysore Government into deposit towards share capital.

TABLE No. 22

Consumption of raw materials in kg. per tonne of pig iron in all the steel plants for the year 1965-66.

	MISL	*Bhilai*	*Rourkela*	*Durgapur*	*TISCO*	*IISCO*
1. Iron ore	1160 (44)	1183 (40.6)	1264 (42.9)	1634 (55.6)	1312 (47.2)	1533 (52.5)
2. Sinter	490 (18.2)	484 (16.6)	266 (9.0)	..	291 (10.4)	..
3. Manganese	30 (1.1)	51 (1.7)	137 (4.7)	27 (1.0)	34 (1.2)	31 (1.1)
4. Coke	525 (19.9)	823 (28.2)	889 (30.0)	885 (30.2)	800 (28.6)	940 (32.2)
5. Lime-stone	450 (17.7)	326 (11.2)	394 (13.4)	380 (13.2)	336 (12.2)	414 (14.2)
6. Quartz	..	50 (1.7)	4 ..	1 ..	11 (0.4)	.. ..
	2655	2917	2954	2927	2784	2918
			% of Sinter to iron ore			
	42.5	41	21	..	22	..

Sources : Statistics for Iron and Steel Industry in India 1966 (HSL).
Figures in brackets represent percentages of each raw material to total charge.

TABLE No. 23

BISL's consumption of iron ore, sinter and coke

	1962–63	1963–64	1964–65	1965–66	1966–67	1967–68
			(in tonnes)			
1 Iron ore ..	1,00,030	61,927	38,569	64,900	76,865	94,444
2. Purchased ore	20,643	27,499	38,605	23,197	975	..
3. Sinter ..	6,801	40,408	45,413	24,464	37,201	16,613
Total ..	1,27,474	1,29,834	1,23,587	1,12,561	1,15,041	1,11,057
4. Coke ..	45,123	39,016	38,038	33,175	33,663	28,498
5. Coke breeze	3,599	9,212	9,829	6,452	13,123	5,158
Total ..	48,722	48,228	47,867	39,627	46,786	33,656
Production of pig iron.	78,497	85,102	81,602	74,713	75,778	73,189
Production of steel ingots.	45,703	47,628	47,992	69,489	75,136	91,589

TABLE No. 24

Quantity and cost of raw materials per tonne of pig iron—MISL—for 1966-67 and 1967-68.

Particulars	1966-67				1967-68			
	Quantity in Kg.	*Rate/Ton in Rs.*	*Cost in Rs.*	*Cost as a % of total*	*Quantity in Kg.*	*Rate/Ton in Rs.*	*Cost in Rs.*	*Cost as a % of total*
1. Iron ore	1,066	27.03	28.82	24.8	1,353	30.40 (11.2)	41.74	34.3
2. Sinter	470	45.18	21.22	18.3	166	64.18 (42)	10.67	8.8
3. Quartz	1	11.69	0.02	..	42	13.59 (18)	0.57	05
4. Manganese ore	33	25.58	0.85	0.70	19	25.69	0.49	0.4
5. Lime-stone	488	12.50	6.11	5.20	492	15.3 (22)	7.54	6.0
6. Coke	518	115.0	59.62	51.0	441	138 (20)	60.38	50.0
Total cost of raw materials ..			116.64	100			121.09	100.00
Total works cost excluding depreciation overheads, financial charges, excise duty ..			273				283	

Note :—Figures in brackets indicate percentage increase in the rate over the previous year.

TABLE No. 24 (concld.)

Cost of raw materials as a % of the works cost of pig iron

			1966-67	1967-68
Iron ore	..	..	10.6	14.8
Sinter	..	..	7.8	3.8
Quartz	..	..	..	0.2
Manganese ore	..	..	0.3	0.2
Lime stone	..	..	2	2.7
Coke	..	..	22	21.4
	Total	..	42.7	43.1

TABLE No. 25

COST OF ELECTRIC POWER AND AVERAGE COST PER UNIT

(*a*) Quantity of electricity consumed and power charges

Year	Metallurgical Power		Non-metallurgical Power		
	Quantity consumed (in million units)	*Electrical charges (in Rs. lakhs)*	*Quantity consumed (in million units)*	*Electrical charges (in Rs. lakhs)*	*Total power charges (in Rs. lakhs)*
1962–63 ..	244.98	66.68	24.89	14.58	81.26
1963–64 ..	306.35	90.99	25.37	15.20	106.19
1964–65 ..	313.06	101.13	28.78	15.66	116.79
1965–66 ..	329.86	121.36	24.28	17.83	139.09
1966–67 ..	344.29	125.30	44.78	28.02	153.32
1967–68 ..	313.22	120.73	48.09	29.59	150.32

(*b*) Average cost of electric power per unit corresponding to the tariff applicable

Period	*Metallurgical rate in paise*	*Non-metallurgical rate in paise*
1-7-1959 to 31-7-1963	2.73	5.64
1-8-1963 to 31-3-1966	3.42	5.81
1-4-1966 to 31-7-1966	3.62	6.365
1-8-1966 to 12-4-1969	3.88	6.19
13-4-1969 onwards	4.00	6.62

TABLE No. 26

Departmentwise break-up of number of persons on pay roll of MISL.

	Department	*As on 1-4-1965*	*As on 1-4-1966*
I.	PRODUCTION		
	(1) Blast furnace	175	175
	(2) Electric pig iron furnace ..	284	218
	(3) Open hearth	687	664
	(4) Arc furnace	26	205
	(5) L. D. plant	..	311
	(6) Old rolling mills	259	286
	(7) Strip & rod mill	227	217
	(8) New rolling mills	..	171
	Sub-total (*a*) ..	1,658	2,247
II.	ANCILLARIES		
	(1) Mines	368	371
	(2) Sintering plant	89	96
	(3) Reheating furnace	74	65
	(4) Oxygen plant	..	34
	Sub-total (*b*) ..	531	566
III.	OTHER PRODUCTION UNITS		
	(1) Foundries	1,344	1,313
	(2) Spun pipe plant	275	223
	(3) Ferro-alloy	455	568
	(4) Cement plant	262	267
	(5) Miscellaneous	390	378
	Sub-total (*c*) ..	2,726	2,749
	Total of (*a*), (*b*) & (*c*)..	4,915	5,562
IV.	Service department	2,308	2,312
V.	Development	972	428
VI.	Administration	30	29
VII.	Factory overhead	554	619
VIII.	Safety & security	193	193
IX.	Selling and distribution	116	138
X.	Welfare	409	400
	Grand Total ..	9,497	9,681

TABLE No. 27

Total Number of Persons Employed, Sales Income and Wages

Year	*Total no. of persons employed as on 31st March*	*Total sales income in crores*	*Total wages Rs. crores*	*Wages as a % of income*	*% increase over previous year*	
					Income	*Total wage*
1963–64	10,035	9.35	1.49	16.0	..	..
1964–65	9,497	10.30	1.55	15.0	10	4.0
1965–66	9,681	12.78	1.87	14.6	24	20.6
1966–67	9,406	13.86	2.09	15.0	8.5	11.8
1967–68	9,347	15.78	2.31	14.6	13.8	10.5

TABLE No. 28

Employment in works in all steel plants for 1965-66.

Particulars	MISL	Hindustan Steel Limited			TISCO	IISCO
		BHILAI	DURGAPUR	ROURKELA		
1. Ingot production in thousand tonnes	71	1,371	1,001	1,065	1,979	970
2. Labour required on the basis of 80 ingot tonnes per man year.	900	17,000	12,050	13,000	25,000	12,000
3. Actual employment in works	2,300	24,200	16,700	16,500	29,000	14,000
4. Difference between 3 & 2	1,400	7,200	4,200	3,500	4,000	2,000
5. 4 as percentage of 2	155	42	35	27	16	17
6. Total number of persons employed as on 1st April 1965.	9,497	36,984	23,550	26,515	64,034	23,274
7. Total wages in Rs. crores	1.9	10.6	8.9	9.2	22.9	14.7

TABLE No. 29

Wage Structure at MISL

Grades	*Daily rated wages before Steel Wage Board recommendation excluding D.A.*	*Converted monthly wages as per Steel Wage Board Recommendation excluding D.A.* (1-4-1965)
	Rs.	Rs.
Grade I ..	3.37 -0.06—4.00	140 -4.50 - 158
Grade II	2.87 -0.06—3.37	120 -4.00— 140
Grade III ..	2.37—0.06—2.87	105—3.50— 119
Grade IV ..	2.00—0.06—2.50	90—3.00— 105
Grade V ..	1.37—0.06—2.00	75—2.50— 90
Grade VI-(*a*) ..	1.00—0.06—1.37	65—2.00—70
	Chargeman ..	90—5.00— 140
	Assistant Foreman ..	130—5.00— 140- 7.50— 185
	Foreman ..	180—7.50— 210
		10.00— 240
	Senior Foreman ..	250-10.00— 260
		15.00— 305

Rates of minimum dearness allowance

Pay range in Rs.	*Amount of D.A. in Rs.*
1— 80	92
81—100	97
101—150	102
151—250	112
Above 250	117

TABLE No. 30

MISL's works cost, direct labour cost and overhead charges for 1967-68

Particulars	*Works cost(1) Rs./ton.*	*Direct labour cost*	*Over-head charges*	*Labour cost as a % of works cost*		
				Direct	*Over-head*	*Total %*
1. *Blast furnace :*						
Pure charcoal ..	315	20.66	29.45	6.5	9.4	15.9
Mixed fuel ..	296	18.80	26.76	6.3	9.0	15.3
2. Electric pig iron furnace ..	283	13.20	21.92	4.7	8.0	12.7
3. Open hearth (Mild steel) ingot	453	40.20	26.07	8.9	6.0	14.9
4. L. D. converters .. mild steel ingot.	702	64.76	21.02	9.2	3.0	12.2
5. Arc furnaces special steel ingot ..	585	21.68	42.52	3.7	7.3	11.0
6. *Rolling mills :*						
M. S. section ..	646	50.68	19.46	7.8	3.0	10.8
Special steel ..	1,077	50.68	19.46	4.7	2.0	6.7
7. *Strip & rod mill :*						
Rods ..	730	58.76	18.81	8.1	2.6	10.7
Strips ..	956	119.20	38.15	12.5	4.0	16.5
8. *New rolling mills :*						
M. S. section ..	826	22.16	15.21	2.7	1.9	4.6
Special steel ..	1,246	22.16	15.21	1.9	1.3	3.2

Note :—(1) Works cost excludes depreciation, financial charges and excise duty.

TABLE No. 31

Number of and payments to foreign technicians at MISL

Year	*Alloy and special steels scheme*			*Steel expansion scheme*			*Electric pig iron furnace*			*Refractories expansion*		
	No.	*Salary*	*Living expenses*	*No.*	*Salary*	*Living expenses*	*No.*	*Salary*	*Living expenses*	*No.*	*Salary*	*Living expenses*
		Rs.	Rs.		Rs.	Rs.		Rs.	Rs.		Rs.	Rs.
1962-63 ..	..	..	..	13	86,016	2,20,863	..	..	..	..	..	..
1963-64 ..	1	4,464	1,291	15	6,88,555	2,03,563	..	..	..		..	..
1964-65 ..	4	60,969	16,095	18	8,36,827	3,34,767	..	..	..	..	..	..
1965-66 ..	10	2,91,797	1,07,977	12	10,03,759	3,65,239	..	..	..	..	..	..
1966-67 ..	6	8,76,875	2,55,097	6	19,04,078	3,38,986	..	..	..	5	1,48,051	51,438
1967-68 ..	38	19,03,775	7,27,458	12	11,35,734	2,20,429		1,40,200	44,384	2	31,113	12,481
1968-69 ..	47	36,85,862	11,94,875	5	11,58,111	52,560		1,41,408	39,693	..	..	..
Total ..		68,23,742	23,02,793		68,13,080	17,36,407		2,81,608	84,077		1,79,164	63,919
Technical Director and Assistants (1968-69).		2,40,222	62,276									
		70,63,964	23,65,069									

TABLE No. 31—(concld.)

ABSTRACT

Year	*Nos.*	*Salary*	*Living Expenses*
		Rs.	Rs.
1962-63 ..	13	86,016	2,20,863
1963-64 ..	16	6,93,019	2,04,854
1964-65 ..	22	8,97,796	3,50,862
1965-66 ..	22	12,95,556	4,73,216
1966-67 ..	17	29,29,004	6,45,521
1967-68 ..	53	32,10,822	10,04,752
1968-69 ..	57	52,25,603	13,49,404
Total ..		1,43,37,816	42,49,472 .. 1,85,87,288

TABLE No. 32

Payments made to M/s. Bohlers, Vienna

Period	*Technical know-how amount*		*Protective rights amount*		*Advice for Planning on purchases amount*		*Royalty amount*		*Total amount*	
	Dollars	*Rupees*	*Dollars*	*Rupees*	*Dollars*	*Rupees*	*Dollars*	*Rupees*	*Dollars*	*Rupees*
1964–65	10,00,000	47,61,904.76	..	..	..	..	..	..	10,00,000.00	47,61,904.79
1965–66	4,00,000	19,04,761.90	..	..	25,000	1,19,047.62	..	..	4,25,000.00	20,23,809.52
1966–67	8,50,000	46,60,990.47	50,000	3,78,300	..	..	..	..	9,00,000.00	50,39,290.47
1967–68	..	..	..	..	..	..	11,622.77	87,127.20	11,622.77	87,127,20
1968–69	..	..	..	..	..	..	17,637.77	1,33,816.39	17,637.77	1,33,816.39
1969–70 (April to September.)	..	..	..	..	..	..	22,190.94	168,289.04	22,190.94	168,289,04
Total ..	22,50,000	1,13,27,657.13	50,000	3,78,300	25,000	1,19,047.62	51,451.48	3,89,232.63	23,76,451.48	1,22,14,237.38

TABLE No. 33

Comparative statement of budget estimates and actuals as per MISL published accounts

(Rupees in lakhs)

Particulars	1966–67			1967–68			1968–69		
	Original estimate	*Revised estimate*	*Actuals*	*Original estimate*	*Revised estimate*	*Actuals*	*Original estimate*	*Revised estimate*	*Actuals*
Income—									
Sale income	1,500	931	904	1,395	1,105	1,180	1,810	1,250	1,179
Other income	85	139	238	128	151	139	126	137	156
Total income ..	1,585	1,070	1,142	1,523	1,256	1,319	1,936	1,387	1,335

Expenses—										
Raw materials	..	..	349	186	175	293	219	231	346	204	218
Stores and spares	..	..	119	92	86	109	131	123	152	121	130
Salaries and wages	..	..	214	210	212	229	241	243	257	250	252
Power and fuel	..	..	428	384	367	336	422	393	489	396	389
Maintenance and repairs	..	..	67	61	60	106	68	68	88	82	90
Miscellaneous expenses	..	..	72	79	104	28	50	81	63	81	111
Excise duty	..	..	..	..	12	..	..	138	174	137	134
Interest	..	..	71	99	38	115	86	85	87	83	119
Depreciation	..	..	108	117	71	124	141	146	141	150	163
Depletion of stocks	..	..	74	(—) 81	(—) 63	66	6	22	73	12	29
Total expenses		..	1,502	1,067	1,098	1,406	1,364	1,530	1,870	1,516	1,641
Expenditure capitalised	..	..	..	..	..	..	159	..	..	..	..
Net profit (+) Net loss (—)	..	..	83	3	44*	117	51	(—)211**	66	(—) 129	(—) 306***

*After capitalising Rs. 121 lakhs interest and 68 lakhs trial operation expenditure and not providing depreciation of Rs. 64 lakhs.

** After capitalising interest charges of Rs. 120 lakhs.

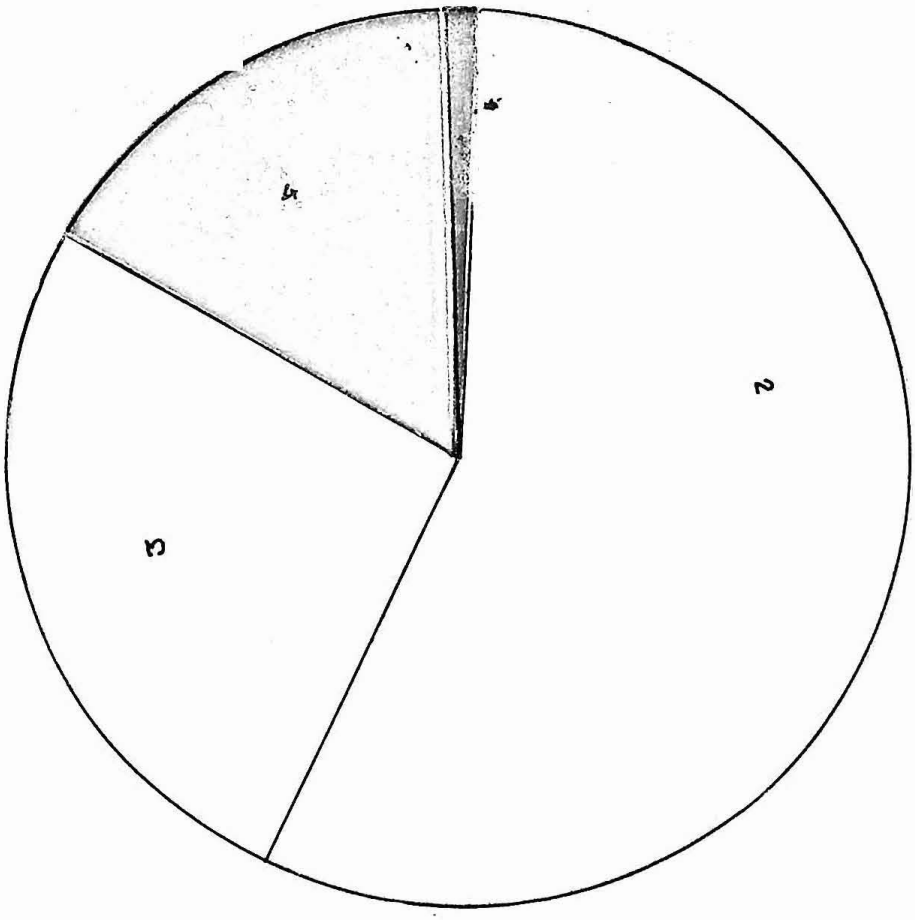
*** After capitalising interest charges of Rs. 129 lakhs.

WD 13422—GPB—800—9-12-1969

CHART No. 1

ALL INDIA PRODUCTION OF PIG IRON

1967-68



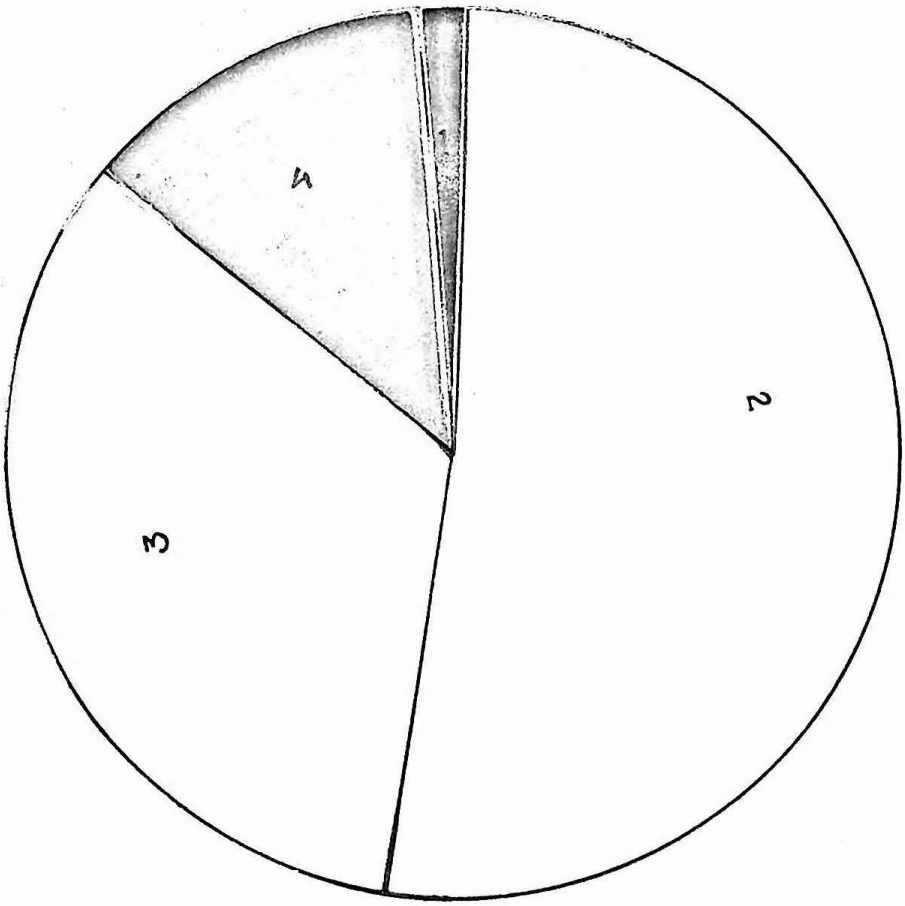
LEGEND

1.	MISL	1%	3.	TISCO	25.9%
2.	H.S.L.	57.3%	4.	IISCO	15.8%

CHART No. 2

ALL INDIA PRODUCTION OF SALEABLE STEEL

1967 – 68



LEGEND

1.	MISL	1.7 %	3.	TISCO	33.0 %
2.	HSL	52.1 %	4.	IISCO	13.2 %

CHART No. 3

MISL—PRODUCTION & DESPATCHES OF PIG IRON

IN THOUSAND TONNES

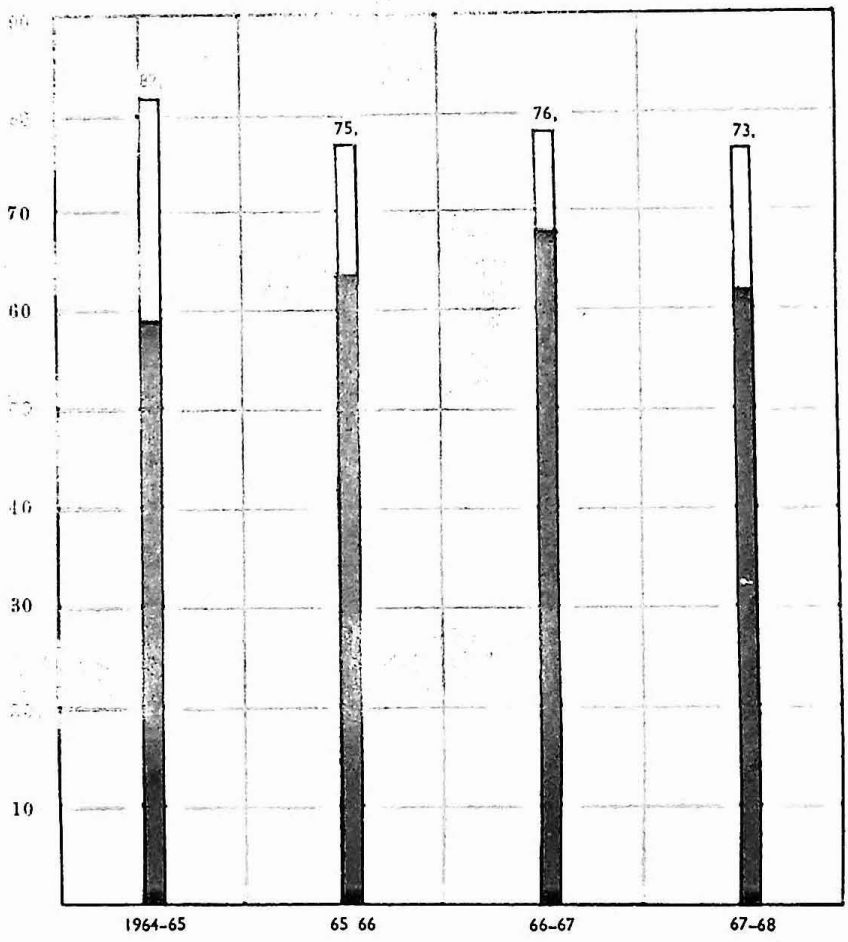


CHART No. 4

IMPORTS, EXPORTS & CONSUMPTION OF SALEABLE STEEL

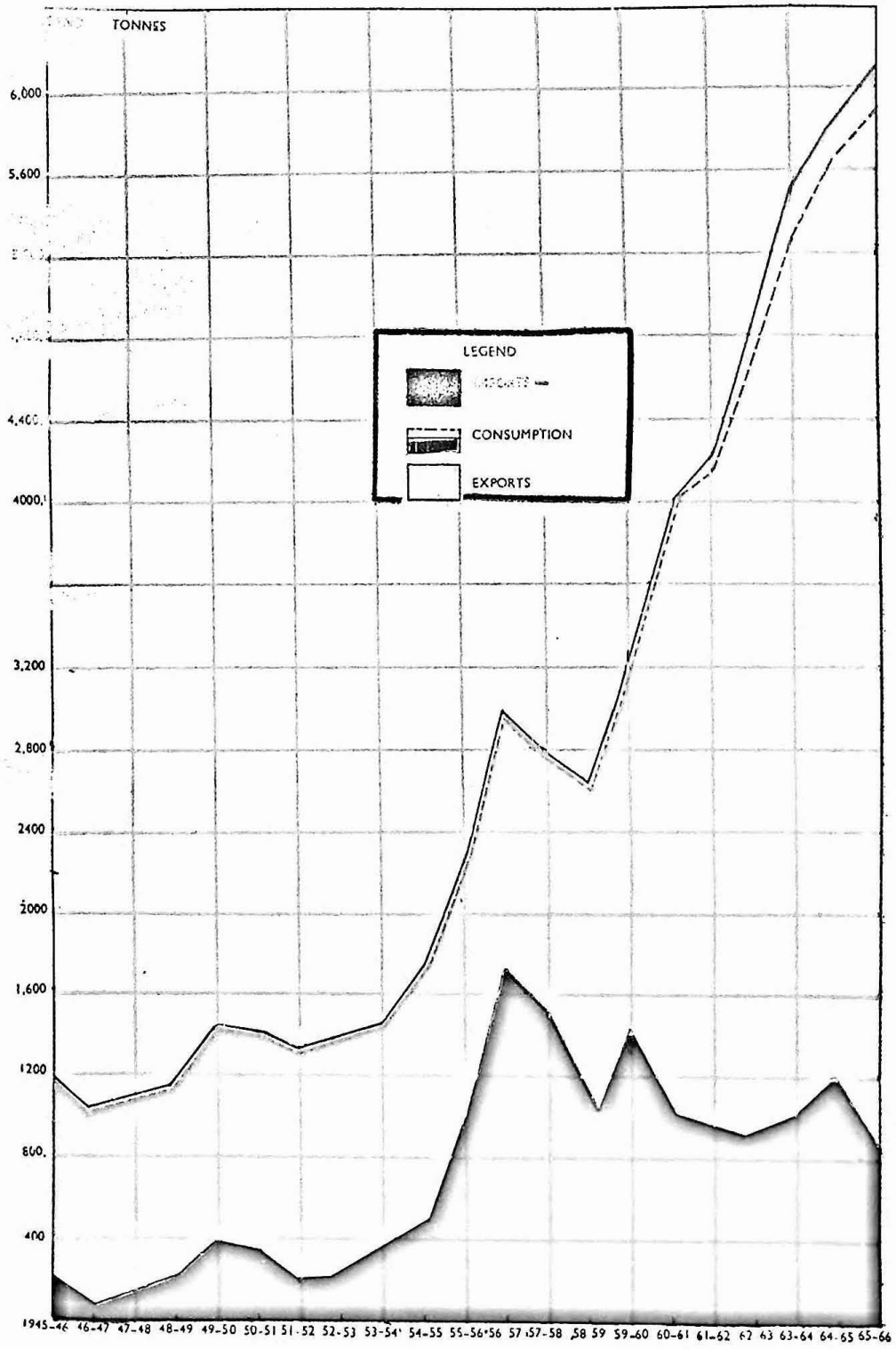
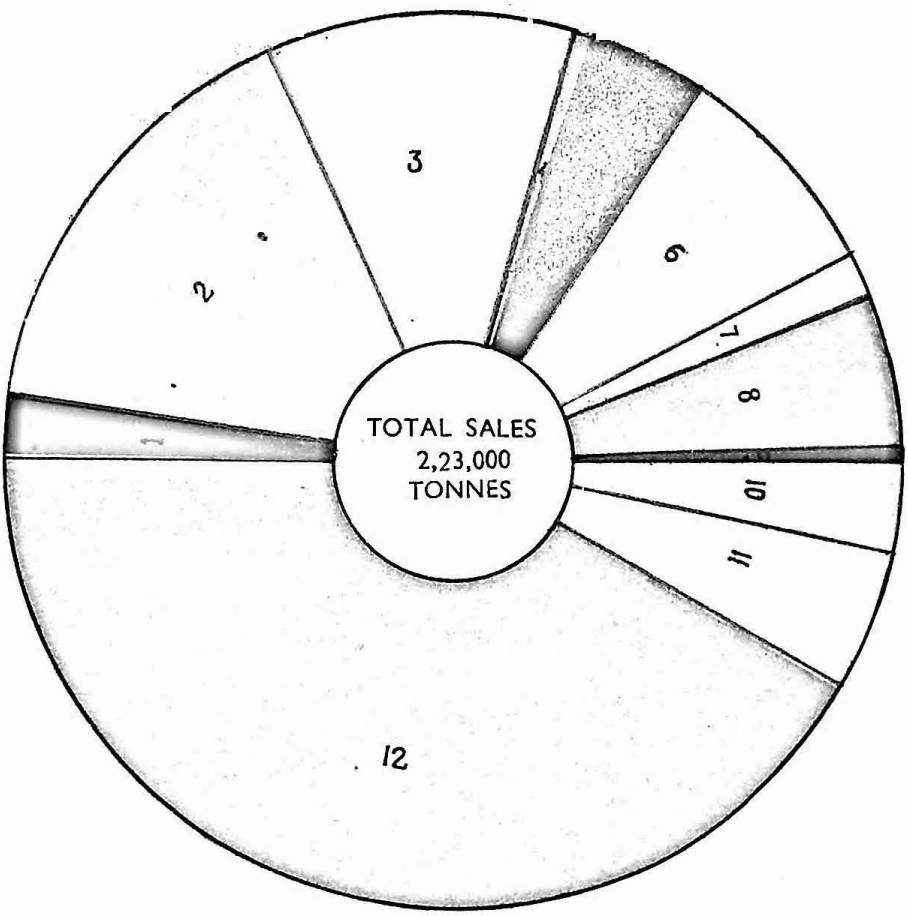


CHART No. 5

MISL--SALES BY PRODUCTS

1967 - 68



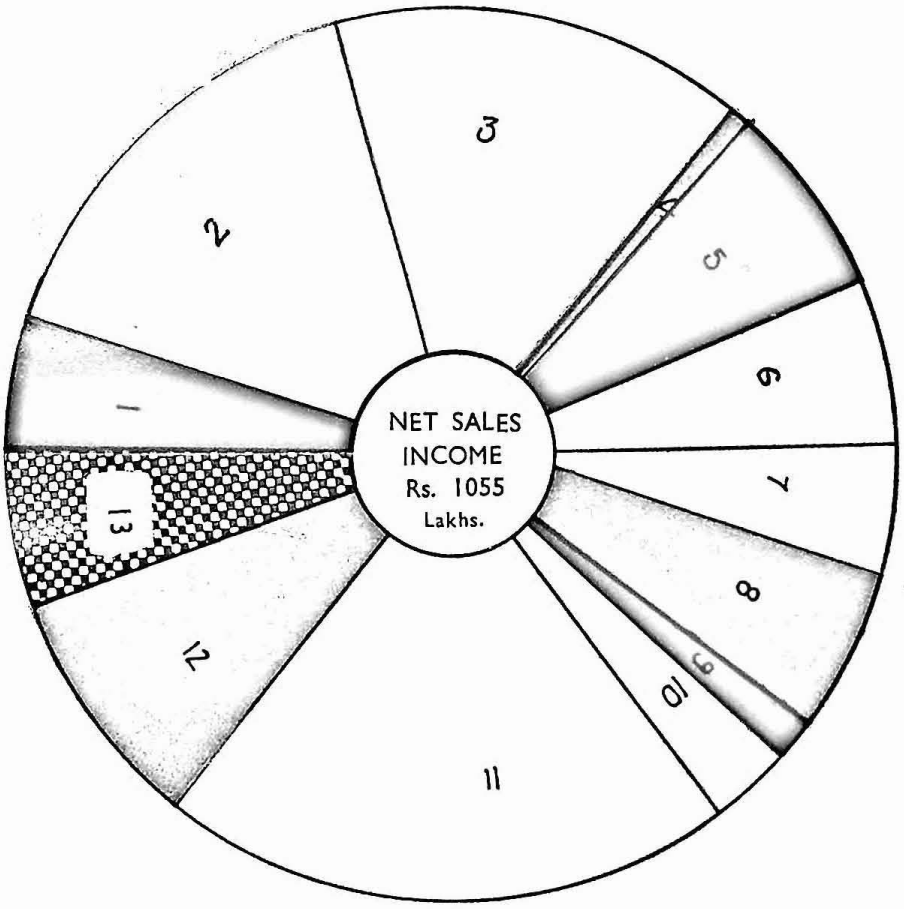
LEGEND

		In Tonnes			in Tonne
1.	Special Steel Sections	5,100	7.	C.I. Pipes	4,600
2.	Mildsteel Blooms, Billets & Slabs	35,000	8.	Spun Pipes	11,600
3.	Mild Steel Sections	25,000	9.	C.I. Castings	1,200
4.	Industrial Scrap	1,200	10.	Sleepers	6,900
5.	Special Steel Coils	9,600	11.	Ferro Silicon	17,800
6.	Pig Iron	18,000	12.	Cement	87,000

CHART No. 6

MISL—SALES INCOME PRODUCTWISE

1967 - 68



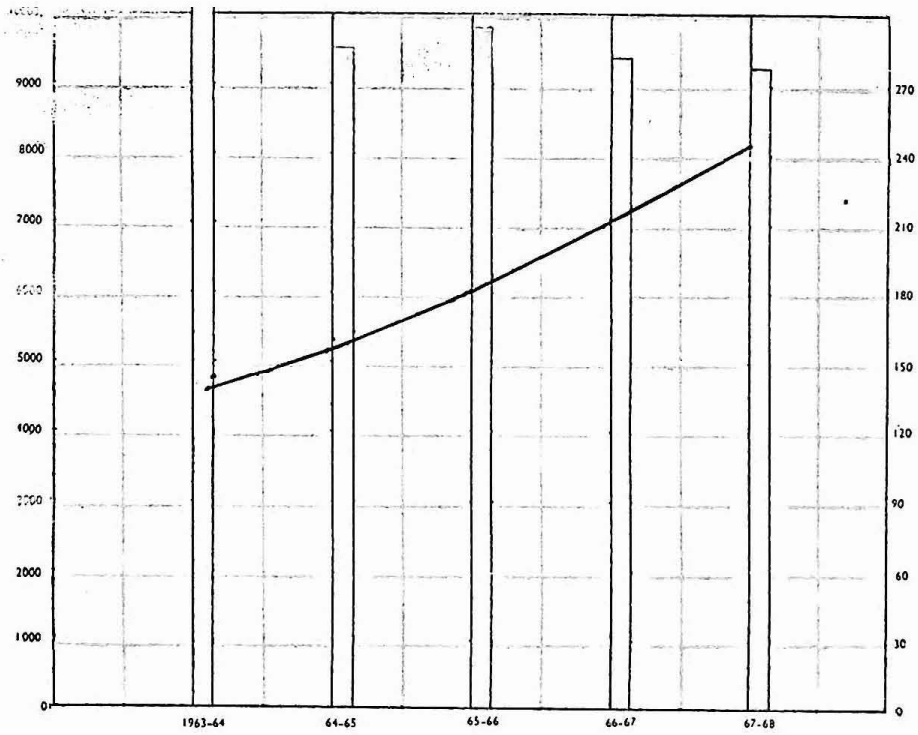
LEGEND

		Rs. Lakhs	%
1.	Special Steel Sections	50	4.7
2.	Mild Steel Blooms, Billets & Slabs	171	16.2
3.	Mild Steel Sections	159	15.2
4.	Industrial Scrap	5	0.5
5.	Special Steel Coil	74	7.0
6.	Pig Iron	64	6.1
7.	C.I. Pipes	31	2.9
8.	Spun Pipes	77	7.3
9.	C.I. Castings	14	1.3
10.	Sleepers	31	2.9
11.	Ferro Silicon	221	21.0
12.	Cement	97	9.2
13.	Miscellaneous	61	5.7
		1055	100.0

CHART No. 7

MISL—NUMBER EMPLOYED & PAYMENTS AND PROVISIONS

Rs. Lakhs.



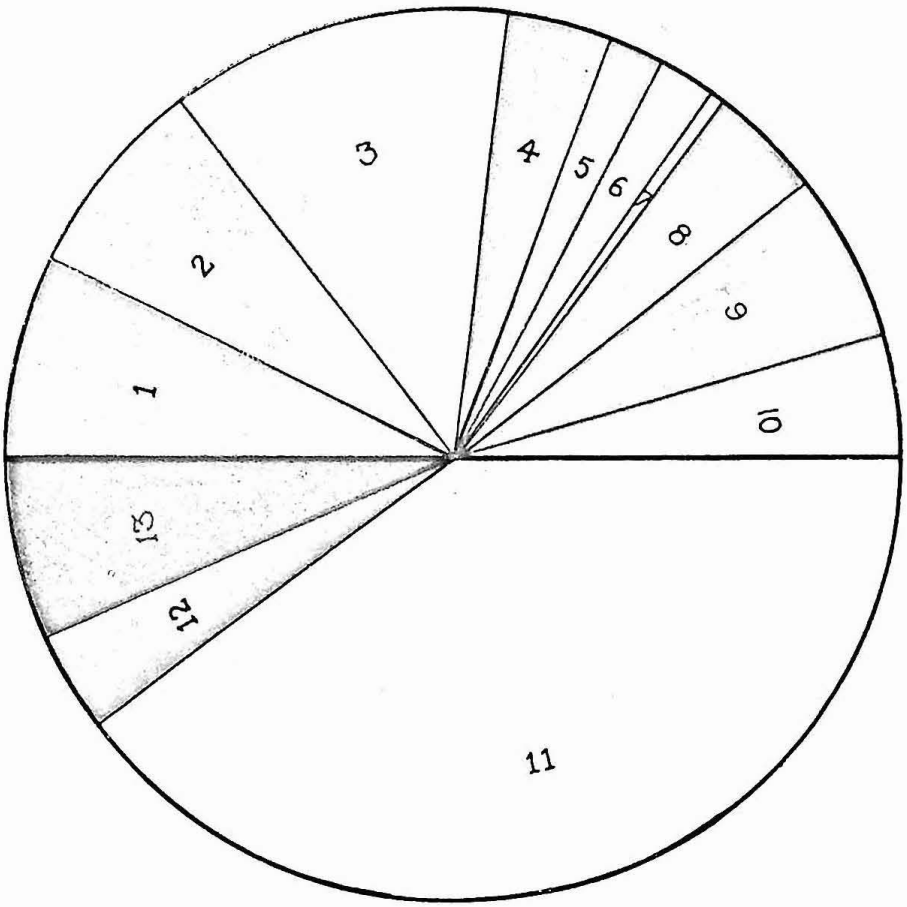
LEGEND

Number Employed — Payments & Provisions

CHART No. 8

MISL—INCOME & EXPENDITURE

1967 - 68



LEGEND

		(In Rs. Lakhs)	%
1.	Raw Materials	231	14.2
2.	Wages & Salaries	243	15.0
3.	Power & Fuel	393	24.3
4.	Stores & Spares	123	7.5
5.	Maintenance & Repairs	67	4.1
6.	Miscellaneous	63	3.9
7.	Freight Outward	19	1.2
8.	Excise Duty	138	8.5
9.	Interest	205	12.3
10.	Depreciation	146	9.0
	Total Expenditure	1628	100.0
11.	Gross Income	1297	79.7
12.	Expenditure Capitalised	120	7.4
13.	Loss	211	12.9
	Total	1628	100.0